Analog-Digital Converter Module

User's Manual

MITSUBISHI

Mitsubishi
Programmable Controller

MELSEC-Q

Q64AD
Q68ADV
Q68ADI
GX Configurator-AD
(SW2D5C-QADU-E)

• SAFETY PRECAUTIONS •

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[DESIGN PRECAUTION]

⚠WARNING

- Do not write data into "System area" of the buffer memory of intelligent function modules. Also, do not use any "Use prohibited" signals as an output signal to an intelligent function module from the programmable controller CPU.
  Writing data into "System area" or outputting a signal for "Use prohibited" may cause a programmable controller system malfunction.

⚠CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 100mm(3.9inch) or more from each other.
  Not doing so could result in noise that may cause malfunction.

[INSTALLATION PRECAUTIONS]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications contained in the user's manual of the CPU module to use.
  Using this programmable controller in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
  Improper installation may result in malfunction, breakdown or the module coming loose and dropping.
  Securely fix the module with screws if it is subject to vibration during use.
- Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause the module to fallout, short circuits, or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout, short circuits or malfunction.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause damage to the module.
  In the system where a CPU module supporting the online module change is used and on the MELSECNET/H remote I/O stations, modules can be replaced online (during energizing).
  However, there are some restrictions on replaceable modules and the replacement procedures are predetermined for each module.
  For details, refer to the chapter of the online module change in this manual.
- Do not directly touch the conductive area or electronic components of the module.
  Doing so may cause malfunction or failure in the module.

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[WIRING PRECAUTIONS]

⚠WARNING

- After wiring, attach the included terminal cover to the module before turning it on for operation. Failure to do so may result in electric shock.

⚠CAUTION

- Individually ground the FG terminal of the programmable controller with a ground resistance of 100Ω or less.
  Failure to do so may result in electric shock or malfunction.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when a terminal screw comes loose, resulting in failure.
- Tighten the terminal screws within the specified torque range.
  Undertightening can cause short circuit, fire, or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Be careful not to let foreign matter such as sawdust or wire chips get inside the module.
  They may cause fires, failure or malfunction.
- The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring.
  Do not remove this film until the wiring is complete.
  Before operating the system, be sure to remove the film to provide adequate ventilation.

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[STARTING AND MAINTENANCE PRECAUTIONS]

⚠WARNING

- Do not touch any terminal while power is on.
  Doing so will cause electric shock or malfunction.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws or module fixing screws.
  Failure to do so may result in electric shock or cause the module to fail or malfunction.
  Undertightening can cause drop of the screw, short circuit, or malfunction.
  Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.

⚠CAUTION

- Do not disassemble or modify the modules.
  Doing so may cause failure, malfunction, injury, or a fire.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause failure or malfunction of the module.
  In the system where a CPU module supporting the online module change is used and on the MELSECNET/H remote I/O stations, modules can be replaced online (during energizing).
  However, there are some restrictions on replaceable modules and the replacement procedures are predetermined for each module.
  For details, refer to the chapter of the online module change in this manual.
- Do not install/remove the module to/from the base unit, or the terminal block to/from the module more than 50 times after the first use of the product. (IEC 61131-2 compliant)
  Failure to do so may cause malfunction.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
  Failure to do so may cause a failure or malfunctions of the module.

[DISPOSAL PRECAUTIONS]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.

• CONDITIONS OF USE FOR THE PRODUCT •

(1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.
MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.
("Prohibited Application")
Prohibited Applications include, but not limited to, the use of the PRODUCT in;
- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

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REVISIONS

* The manual number is given on the bottom left of the back cover.

Print Date	* Manual Number	Revision
Dec., 1999	SH (NA)-080055-A	First printing
Oct., 2000	SH (NA)-080055-B	Add the contents of the function version B. [Correction] About the Generic Terms and Abbreviations, Section 2.1, Section 3.1.3, 3.4.1, Section 4.3, 4.4.2, Section 5.2.1, 5.2.2, 5.3.3, 5.6.1 [Partial addition] Section 1.1, Section 3.1.1, 3.1.2, 3.2, 3.3.1, 3.3.2, Section 4.5, Section 7.2.3, 7.2.4 [Addition] Section 1.2, Section 2.2, Appendix 1, 1.1, 1.2, 1.3
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Japanese Manual Version SH-080028-W

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INTRODUCTION

Thank you for purchasing the MELSEC-Q series programmable controller.
Before using the product, please read this manual carefully to develop full familiarity with the functions and performance of the Q series programmable controllers to ensure correct use.

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ABOUT MANUALS

The following manuals are also related to this product.

If necessary, order them by quoting the details in the tables below.

Related Manuals

Manual Name	Manual Number (Model Code)
GX Developer Version 8 Operating Manual Describes the methods of using GX Developer to create a program and print out, monitor, and debug the program. (Sold separately)	SH-080373E (13JU41)
GX Developer Version 8 Operating Manual (Function Block) Describes the methods of using GX Developer to create a function block and print out the function block. (Sold separately)	SH-080376E (13JU44)
GX Works2 Version 1 Operating Manual (Common) Describes the system configuration, parameter settings, and online operations (common to Simple project and Structured project) of GX Works2 (Sold separately)	SH-080779E (13JU63)
GX Works2 Version 1 Operating Manual (Intelligent Function Module) Explains methods of intelligent function module for such as parameter setting, monitoring programs, and predefined protocol support function in GX Works2. (Sold separately)	SH-080921ENG (13JU69)

REMARK

If you would like to obtain a manual individually, printed matters are available separately. Order the manual by quoting the manual number on the table above (model code).

COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- QCPU User's Manual (Hardware Design, Maintenance and Inspection)
- Safety Guidelines
  (This manual is included with the CPU module or base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

No additional measures are necessary for the compliance of this product with EMC and Low Voltage Directives.

ABOUT THE GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following general terms and abbreviations.

Abbreviation/general terms	Description of the abbreviation/general terms
A/D converter module	Generic term for Q64AD, Q68ADI, Q68ADV
Personal computer	IBM PC/AT® or compatible computer with DOS/V.
GX Developer	Product name of the software package for the MELSEC programmable controllers
GX Works2	
GX Configurator-AD	Generic term for analog-digital converter module setting and monitor tool GX Configurator-AD (SW2D5C-QADU-E)
QCPU (Q mode)	Generic term for Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU, Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU, Q13UDHCPU, Q20UDHCPU, Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q50UDEHCPU, and Q100UDEHCPU.
Process CPU	Generic term for Q02PHCPU, Q06PHCPU, Q12PHCPU and Q25PHCPU.
Redundant CPU	Generic term for Q12PRHCPU, Q25PRHCPU.
Personal computer	Generic term for DOS/V personal computer
Factory setting	Generic term for analog input ranges 0 to 10V, 0 to 5V, 1 to 5V, -10 to 10V, 0 to 20mA and 4 to 20mA
FB	Abbreviation of function block.
Windows Vista®	Generic term for the following: Microsoft® Windows Vista® Home Basic Operating System, Microsoft® Windows Vista® Home Premium Operating System, Microsoft® Windows Vista® Business Operating System, Microsoft® Windows Vista® Ultimate Operating System, Microsoft® Windows Vista® Enterprise Operating System
Windows® XP	Generic term for the following: Microsoft® Windows® XP Professional Operating System, Microsoft® Windows® XP Home Edition Operating System
Windows® 7	Generic term for the following: Microsoft® Windows® 7 Starter Operating System, Microsoft® Windows® 7 Home Premium Operating System, Microsoft® Windows® 7 Professional Operating System, Microsoft® Windows® 7 Ultimate Operating System, Microsoft® Windows® 7 Enterprise Operating System Note that the 32-bit version is designated as "32-bit Windows® 7", and the 64-bit version is designated as "64-bit Windows® 7".

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PRODUCT STRUCTURE

The product structure of this product is given in the table below.

Model code	Product name	Quantity
Q64AD	Q64AD Model Analog-Digital Converter Module	1
Q68ADV	Q68ADV Model Analog -Digital Converter Module	1
Q68ADI	Q68ADI Model Analog -Digital Converter Module	1
SW2D5C-QADU-E	GX Configurator-AD Version 2 (1-license product) (CD-ROM)	1
SW2D5C-QADU-EA	GX Configurator-AD Version 2 (Multiple-license product) (CD-ROM)	1

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1 OVERVIEW

This User's Manual describes the specifications, handling and programming methods for the Q64AD analog-digital converter module (hereinafter referred to as the Q64AD), Q68ADV analog-digital converter module (hereinafter referred to as the Q68ADV), and Q68ADI analog-digital converter module (hereinafter referred to as the Q68ADI), which are used in conjunction with MELSEC-Q Series CPUs.
In this manual, the Q64AD, Q68ADV, and Q68ADI are collectively referred to as the A/D converter modules.

1.1 Features

(1) Select the type of module according to the application.

- Q64AD ····· 4 channels, where the voltage input or current input can be selected for each channel.
- Q68ADV ····· 8 channels, all of which are voltage input.
- Q68ADI ····· 8 channels, all of which are current input.

(2) High speed conversion

Conversion is performed at a high speed of 80 μs/channel. Also, the temperature drift compensation function can be performed using a processing time of "conversion time for all channels + 160 μs".

(3) High degree of accuracy

The degree of accuracy for the conversion process is ± 0.1% (When the ambient temperature is 25 ± 5 °C).

(4) Changing the resolution mode

The resolution mode can be changed according to the application, and digital-value resolution settings of 1/4000, 1/12000 or 1/16000 can be selected.

(5) Changing the input range

The input range *1 can easily be set from GX Developer.

*1: Input range refers to the type of offset/gain settings. The most frequently used range is set as the default but the user can also set the offset/gain.

(6) Easy settings with GX Configurator-AD

The number of sequence programs can be reduced since GX Configurator-AD (sold separately) allows A/D converter module settings in the dialog box.
Also, GX Configurator-AD simplifies checking of the module settings and operation status.
In addition, FB *1 can be automatically created from intelligent function module parameters set in advance to use them in a sequence program.

*1: FB is the function for making a circuit block used in a sequence program repeatedly a part (FB) to use it in the sequence program.
This function can improve the efficiency of program development and minimize program bugs to improve program qualities.

For details of FB, refer to "GX Developer Version 8 Operating Manual (Function Block)."

1.2 Functions Added to Function Version B and Later

(1) Functions added to function version B

The functions added by the function version B A/D converter module are listed below.

Item	Function overview	Reference section
Multiple CPU system compatibility	Compatible with a multiple CPU system. A programmable controller CPU of function version B or later are required.	Section 2.1
Resolution mode	The resolution mode can be changed according to the application, and digital-value resolution settings of 1/4000, 1/12000 or 1/16000 can be selected.	Section 3.2
High resolution mode status flag (X8)	This turns on when the high resolution mode is set.	Section 3.3
Maximum value/minimum value reset completed flag (XD)	This signal turns on when the maximum and minimum values stored in Maximum and minimum values storage area (buffer memory address 30 to 45: Un\G30 to Un\G45) are reset by Maximum value/minimum value reset request (YD).	Section 3.3

(2) Functions added to function version C

The functions added to the A/D converter module of function version C are listed below.

Item	Function overview	Reference section
Online module change	You can change the module without stopping the system. A programmable controller CPU of function version C or later is required.	Chapter 7
Mode switching that does not require programmable controller CPU to be reset	Using Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159) and Operating condition setting request (Y9), the module is switched between the normal mode and offset/gain setting mode without the programmable controller CPU being reset.	Section 3.4.13
	Using the dedicated instruction (G(P).OFFGAN), the module is switched between the normal mode and offset/gain setting mode without the programmable controller CPU being reset.	Appendix 2.1
	Using GX Configurator-AD, the module is switched between the normal mode and offset/gain setting mode without the programmable controller CPU being reset.	Section 5.6.2

POINT

(1) Refer to Appendix 1.1 for a comparison of functions of the function version.
(2) Refer to Section 2. 3 on how to check the function version.

2 SYSTEM CONFIGURATION

This chapter explains the system configuration of the A/D converter module.

2.1 Applicable Systems

This section describes applicable systems.

(1) Applicable modules and base units, and No. of modules

(a) When mounting to CPU module

The table below shows the CPU modules and base units applicable to the A/D converter module and quantities for each CPU model.
Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.
Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable CPU module			No. of modules ∗1	Base unit ∗2	
CPU type		CPU model		Main base unit	Extension base unit
Programmable controller CPU	Basic model QCPU	Q00JCPU	Up to 8	○	○
		Q00CPU	Up to 24		
		Q01CPU			
	High Performance model QCPU	Q02CPU	Up to 64	○	○
		Q02HCPU			
		Q06HCPU			
		Q12HCPU			
		Q25HCPU			
	Process CPU	Q02PHCPU	Up to 64	○	○
		Q06PHCPU			
		Q12PHCPU			
		Q25PHCPU			
	Redundant CPU	Q12PRHCPU	Up to 53	×	○
		Q25PRHCPU			
	Universal model QCPU	Q00UJCPU	Up to 16	○	○
		Q00UCPU	Up to 24		
		Q01UCPU			
		Q02UCPU	Up to 36		
		Q03UDCPU	Up to 64		
		Q04UDHCPU			
		Q06UDHCPU			
		Q10UDHCPU			
		Q13UDHCPU			
		Q20UDHCPU			
		Q26UDHCPU			

○ : Applicable, × : N/A

Applicable CPU module			No. of modules ＊1	Base unit ＊2	
CPU type		CPU model		Main base unit	Extension base unit
Programmable controller CPU	Universal model QCPU	Q03UDECPU	Up to 64	○	○
		Q04UDEHCPU			
		Q06UDEHCPU			
		Q10UDEHCPU			
		Q13UDEHCPU			
		Q20UDEHCPU			
		Q26UDEHCPU			
		Q50UDEHCPU			
		Q100UDEHCPU			
	Safety CPU	QS001CPU	N/A	×	× ＊3
C Controller module		Q06CCPU-V	Up to 64	○	○
		Q06CCPU-V-B			
		Q12DCCPU-V			
		Q24DHCCPU-V	Up to 62		

○ : Applicable, × : N/A

＊1: Limited within the range of I/O points for the CPU module.

＊2: Can be installed to any I/O slot of a base unit.

＊3: The safety CPU cannot be connected with extension base units.

Remark

For the use of the C Controller module, refer to C Controller Module User's Manual.

(b) Mounting to a MELSECNET/H remote I/O station

The table below shows the network modules and base units applicable to the A/D converter module and quantities for each network module model. Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient.
Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable network module	No. of modules ＊1	Base unit ＊2	
		Main base unit of remote I/O station	Extension base unit of remote I/O station
QJ72LP25-25	Up to 64	○	○
QJ72LP25G			
QJ72LP25GE			
QJ72BR15			

○ : Applicable, × : N/A

＊1: Limited within the range of I/O points for the network module.

＊2: Can be installed to any I/O slot of a base unit.

Remark

The Basic model QCPU or C Controller module cannot create the MELSECNET/H remote I/O network.

2 - 2

(2) Support of the multiple CPU system

When using the A/D converter module in a multiple CPU system, refer to the following manual first.

- QCPU User's Manual (Multiple CPU System)

(a) Supported A/D converter module

Use an A/D converter module with function version B or higher if using the module in a multiple CPU system.

(b) Intelligent function module parameters

Write intelligent function module parameters to only the control CPU of the A/D converter module.

(3) Compatibility with online module change

To make an online module change, use the module of function version C or later.

(4) Supported software packages

Relation between the system containing the A/D converter modules and software package is shown in the following table.
GX Developer or GX Works2 are necessary when using the A/D converter module.

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Software Version</th></tr>
<tr><th>GX Developer</th><th>GX Configurator-AD ∗1</th><th>GX Works2</th></tr>
<tr><td rowspan="2">Q00J/Q00/
Q01CPU</td><td>Single CPU system</td><td>Version 7 or later</td><td rowspan="3">Version 1.10L or later
(cannot be used with the
SW0D5C-QADU-E 50F
or earlier versions).</td><td rowspan="4">Version 1.15R or later</td></tr>
<tr><td>Multiple CPU system</td><td>Version 8 or later</td></tr>
<tr><td rowspan="2">Q02/Q02H/
Q06H/ Q12H/
Q25HCPU</td><td>Single CPU system</td><td>Version 4 or later</td><td>SW0D5C-QADU-E 00A
or later</td></tr>
<tr><td>Multiple CPU system</td><td>Version 6 or later</td><td>SW0D5C-QADU-E 20C
or later</td></tr>
<tr><td rowspan="2">Q02PH/
Q06PHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.68W or later</td><td rowspan="3">Version 1.13P or later
(cannot be used with the
SW0D5C-QADU-E 50F
or earlier versions).</td><td rowspan="4">Version 1.87R or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q12PH/
Q25PHCPU</td><td>Single CPU system</td><td rowspan="2">Version 7.10L or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td>Q12PRH/
Q25PRHCPU</td><td>Redundant System</td><td>Version 8.45X or later</td><td>Version 1.15R or later</td></tr>
<tr><td rowspan="2">Q00UJ/Q00U/
Q01UCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.78G or later</td><td rowspan="11">Version 2.05F or later</td><td rowspan="11">Version 1.15R or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q02U/Q03UD/
Q04UDH/
Q06UDHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.48A or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q10UDH/
Q20UDHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.78G or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q13UDH/
Q26UDHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.62Q or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q03UDE/
Q04UDEH/
Q06UDEH/
Q13UDEH/
Q26UDEHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.68W or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q10UDEH/
Q20UDEHCPU</td><td>Single CPU system</td><td rowspan="2">Version 8.78G or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td rowspan="2">Q50UDEHCPU/
Q100UDEHCPU</td><td>Single CPU system</td><td rowspan="2">Cannot be used</td><td rowspan="2">Cannot be used</td><td rowspan="2">Version 1.31H or later</td></tr>
<tr><td>Multiple CPU system</td></tr>
<tr><td colspan="2">If installed in a MELSECNET/H remote I/O station</td><td>Version 6 or later</td><td>SW0D5C-QADU-E 50F
or later</td><td>Version 1.40S or later</td></tr>
</table>

∗1: Refer to Appendix 1.2 for the combinations of the A/D converter module functions and GX Configurator-AD software versions.

POINT

(1) The products of function version C include the functions of the products of function versions A and B.
(2) Depending on the version of GX Configurator-AD, systems, CPU modules, and functions of the A/D converter modules differ.
(3) When using GX Works2, refer to the following.
• GX Works2 Version 1 Operating Manual (Common)
• GX Works2 Version 1 Operating Manual (Intelligent Function Module)

2.2 Precautions on System Configuration

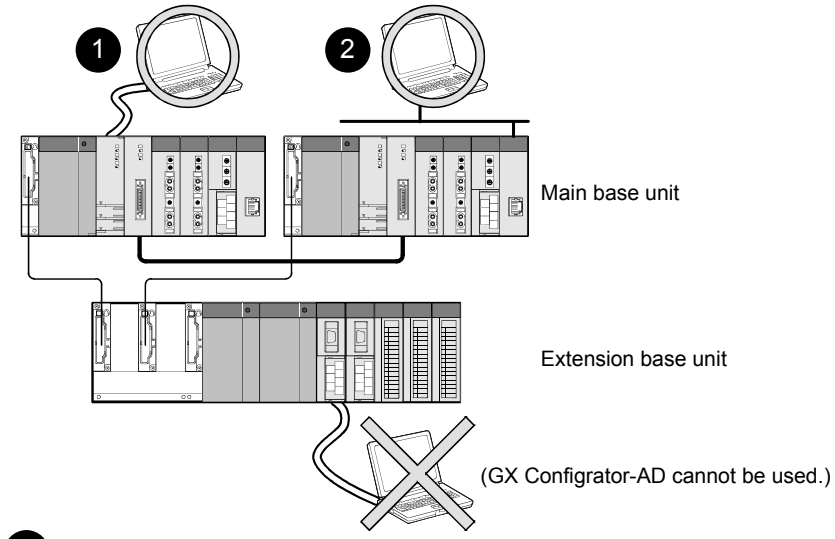
(1) Using A/D converter modules with Redundant CPU

(a) Dedicated instruction

The dedicated instruction cannot be used.

(b) GX Configurator-AD

GX Configurator-AD cannot be used when accessing the Redundant CPU via an intelligent function module on an extension base unit from GX Developer.
Connect a personal computer to the Redundant CPU with a communication path indicated below.



1 Direct connection to the CPU

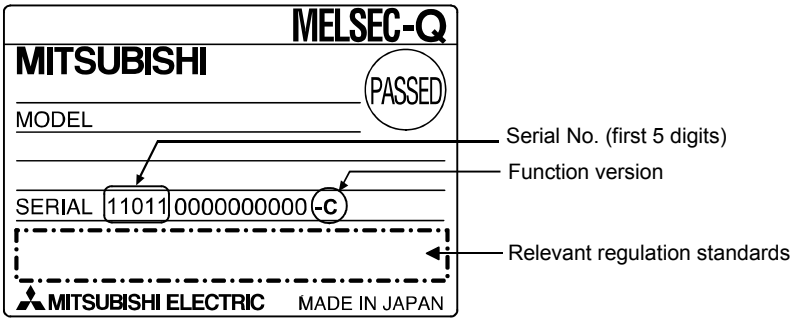
2 Connection through an intelligent function module on the main base unit
(Through Ethernet module, MELSECNET/H module, or CC-Link module)

2.3 Checking Function Version, Serial Number, and Software Version

(1) Checking the function version and serial number of the A/D converter modules

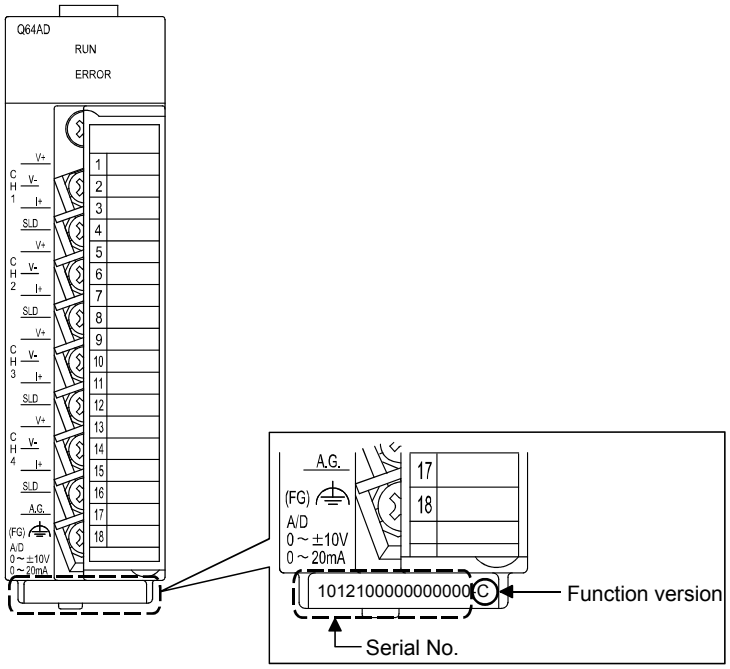
The serial number and function version of the A/D converter modules are described in the rating plate, on the front part of the module, or displayed in the System monitor dialog box of GX Developer.

(a) Checking on the rating plate on the side of the A/D converter modules



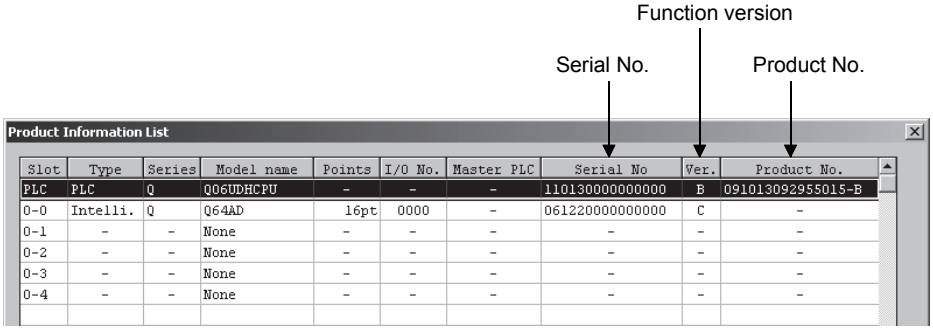
(b) Checking on the front of the module

The serial number and function version on the rating place is shown on the front (at the bottom) of the module.



(c) Checking in the System monitor dialog box (Product Information List)

To display the system monitor, select [Diagnostics] → [System monitor] and click the Product Information List button of GX Developer.



Slot	Type	Series	Model name	Points	I/O No.	Master PLC	Serial No	Ver.	Product No.
PLC	PLC	Q	Q06UDHCPU	-	-	-	110130000000000	B	091013092955015-B
0-0	Intelli.	Q	Q64AD	16pt	0000	-	061220000000000	C	-
0-1	-	-	None	-	-	-	-	-	-
0-2	-	-	None	-	-	-	-	-	-
0-3	-	-	None	-	-	-	-	-	-
0-4	-	-	None	-	-	-	-	-	-

1) Displaying the product No.

Since the A/D converter modules do not support the production number display,
"-" is displayed in the "Product No." field.

POINT

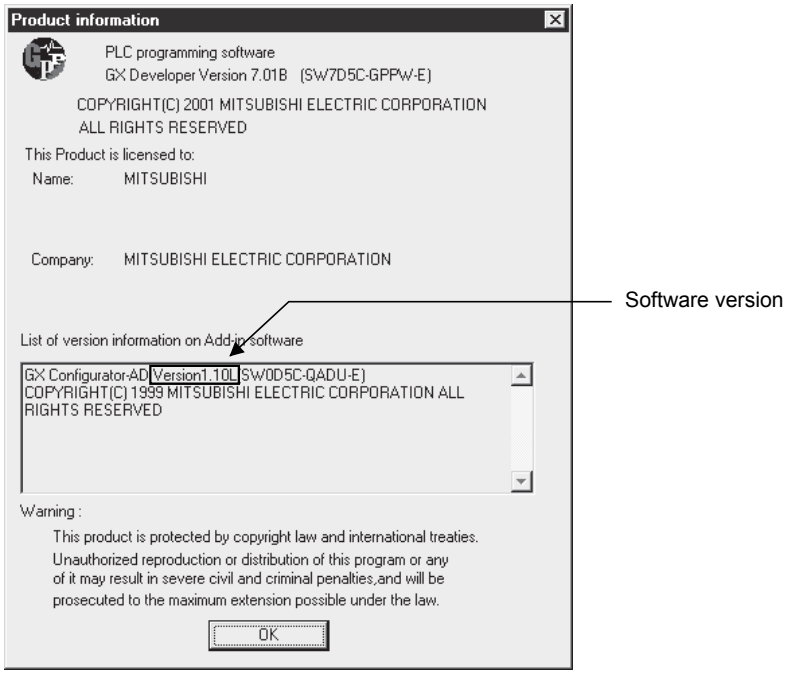
The serial number displayed in the Product information list dialog box of GX Developer may differ from that on the rating plate and on the front of the module.

- The serial number on the rating plate and front part of the module indicates the management information of the product.
- The serial number displayed in the Product information list dialog box of GX Developer indicates the function information of the product.

The function information of the product is updated when a new function is added.

(2) Checking the software version of GX Configurator-AD

The software version of GX Configurator-AD can be checked by selecting [Help] → [Product information] on GX Developer.


Product information
PLC programming software
GX Developer Version 7.01B (SW7D5C-GPPW-E)
COPYRIGHT(C) 2001 MITSUBISHI ELECTRIC CORPORATION
ALL RIGHTS RESERVED
This Product is licensed to:
Name: MITSUBISHI
Company: MITSUBISHI ELECTRIC CORPORATION
List of version information on Add-in software
GX Configurator-AD Version1.10L SW0D5C-QADU-E)
COPYRIGHT(C) 1999 MITSUBISHI ELECTRIC CORPORATION ALL RIGHTS RESERVED
Warning :
This product is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program or any of it may result in severe civil and criminal penalties,and will be prosecuted to the maximum extension possible under the law.
OK
Software version

(In the case of GX Developer Version 7)

REMARK

The version indication for GX Configurator-AD has been changed as shown below from the SW0D5C-QADU-E 50F upgrade product.

Previous product		Upgrade and subsequent versions
SW0D5C-QADU-E 50F	→	GX Configurator-AD Version 1.10L

MEMO

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3 SPECIFICATIONS

3.1 Performance Specifications

3.1.1 Performance specifications list

Table 3.1 shows the performance specifications of the A/D converter modules.

Table 3.1 Performance specifications

Item \ Model name		Q64AD	Q68ADV	Q68ADI
Analog input points		4 points (4 channels)	8 points (8 channels)	8 points (8 channels)
Analog input	Voltage	–10 to 10 V DC (Input resistance value 1M Ω)		———
	Current	0 to 20 mA DC (input resistance value 250 Ω)	———	0 to 20 mA DC (input resistance value 250 Ω)
Digital output		16-bit signed binary (normal resolution mode: –4096 to 4095, high resolution mode: –12288 to 12287, –16384 to 16383		

I/O characteristics, Maximum resolution

Analog input range		Normal resolution mode		High resolution mode	
		Digital output value	Maximum resolution	Digital output value	Maximum resolution
Voltage	0 to 10 V	0 to 4000	2.5 mV	0 to 16000	0.625 mV
	0 to 5 V		1.25 mV	0 to 12000	0.416 mV
	1 to 5 V		1.0 mV		0.333 mV
	–10 to 10 V	–4000 to 4000	2.5 mV	–16000 to 16000	0.625 mV
	Users range setting		0.375 m V	–12000 to 12000	0.333 mV
Current	0 to 20 mA	0 to 4000	5 μA	0 to 12000	1.66 μA
	4 to 20 mA		4 μA		1.33 μA
	Users range setting	–4000 to 4000	1.37 μA	–12000 to 12000	1.33 μA

Accuracy (Accuracy in respect to maximum digital output value)

Analog input range		Normal resolution mode			High resolution mode		
		Ambient temperature 0 to 55 °C		Ambient temperature 25 ± 5 °C	Ambient temperature 0 to 55 °C		Ambient temperature 25 ± 5 °C
		With temperature drift correction	Without temperature drift correction		With temperature drift correction	Without temperature drift correction	
Voltage	0 to 10 V	Within ± 0.3 % (± 12 digit ＊1)	Within ± 0.4 % (± 16 digit ＊1)	Within ± 0.1 % (± 48 digit ＊1)	Within ± 0.3 % (± 48 digit ＊1)	Within ± 0.4 % (± 64 digit ＊1)	Within ± 0.1 % (± 16 digit ＊1)
	–10 to 10 V						
	0 to 5 V				Within ± 0.3 % (± 36 digit ＊1)	Within ± 0.4 % (± 48 digit ＊1)	Within ± 0.1 % (± 12 digit ＊1)
	1 to 5 V						
	Users range setting						
Current	0 to 20 mA						
	4 to 20 mA						
	Users range setting						

Item \ Model name	Q64AD	Q68ADV	Q68ADI
Conversion speed	80 μs/channel (When there is temperature drift, the time calculated by adding 160 μs will be used regardless of the number of channels used)		
Absolute maximum input	Voltage : ± 15 V Current : ± 30 mA ∗2		
E^2PROM write count	Max. 100 thousand times		
Insulation method	Between the I/O terminal and programmable controller power supply : Photocoupler insulation Between channels : Non-insulated		
Dielectric withstand voltage	Between the I/O terminal and programmable controller power supply: 500VAC for 1 minute		
Insulation resistance	Between the I/O terminal and programmable controller power supply: 500VDC 20MΩ or more		
I/O occupied points	16 points (I/O assignment: Intelligent 16 points)		
Connection terminals	18-point terminal block		
Applicable wire size	0.3 to 0.75 mm^2		
Applicable solderless terminal	R1.25-3 (A solderless terminal with sleeve cannot be used)		
Internal current consumption (5 VDC)	0.63 A	0.64 A	0.64 A
Weight	0.18 kg	0.19 kg	0.19 kg

∗1: Digit indicates a digital value.
∗2: Current value indicates value of instant input current that does not break module inner electrical resistance.

REMARK

Refer to the user's manual for the CPU module being used for general specifications of the A/D converter modules.

3.1.2 I/O conversion characteristic

The I/O conversion characteristic represents the angle formed by a straight line connecting the "offset value" and "gain value" when the analog signals (voltage or current input) from outside the programmable controller are converted to digital values.

Offset value

The offset value denotes the analog input value (voltage or current) that makes Digital output value 0.

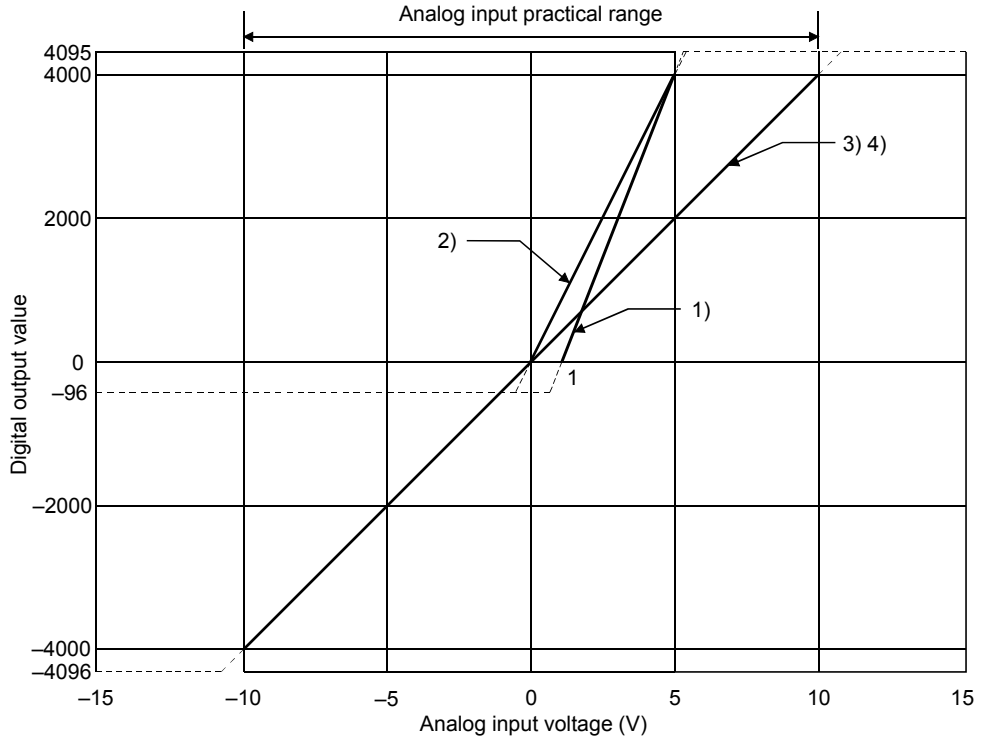
Gain value

The gain value denotes the analog input value (voltage or current) that makes Digital output value:
4000 (in normal resolution mode)
12000 (when 0 to 5 V, 1 to 5 V, 4 to 20 mA, 0 to 20 mA or the user range setting is selected in high resolution mode)
16000 (when -10 to 10 V or 0 to 10 V is selected in high resolution mode).

(1) Voltage input characteristic

(a) Voltage input characteristic in normal resolution mode

Figure 3.1 shows a graph of the voltage input characteristic in normal resolution mode.

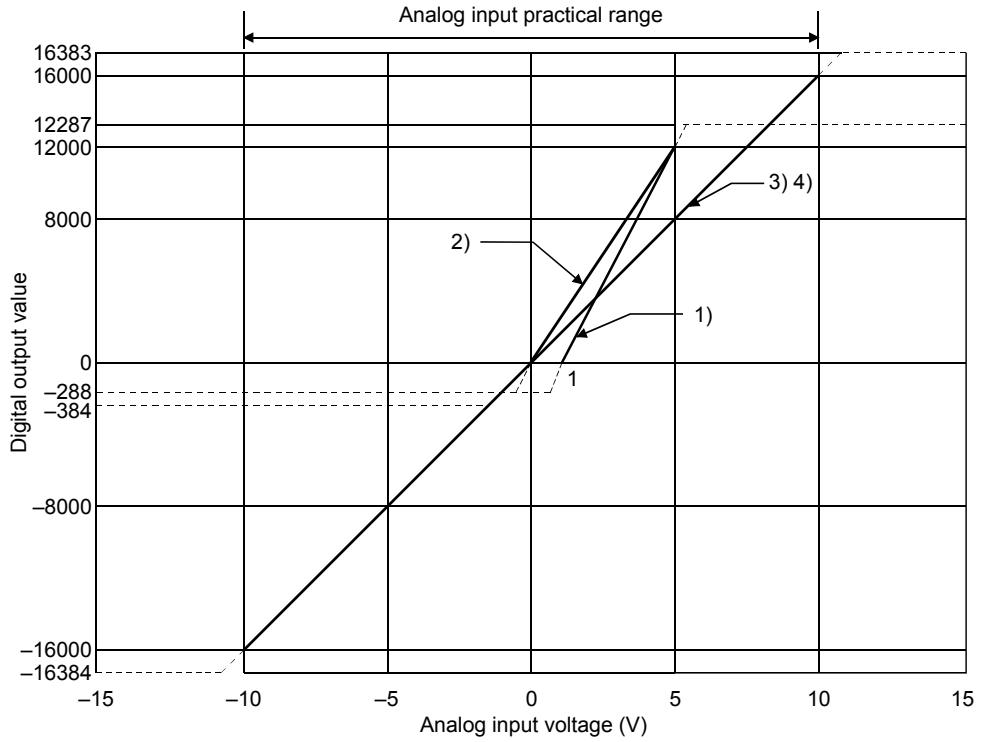


Number	Analog input range setting	Offset value	Gain value	Digital output value ＊2	Maximum resolution
1)	1 to 5 V	1 V	5 V	0 to 4000	1.0 mV
2)	0 to 5 V	0 V	5 V		1.25 mV
3)	–10 to 10 V	0 V	10 V	–4000 to 4000	2.5 mV
4)	0 to 10 V	0 V	10 V	0 to 4000	2.5 mV
—	User range setting	＊1	＊1	–4000 to 4000	0.375 mV

Figure 3.1 Voltage input characteristic in normal resolution mode

(b) Voltage input characteristic in high resolution mode

Figure 3.2 shows a graph of the voltage input characteristic in high resolution mode.



Number	Analog input range setting	Offset value	Gain value	Digital output value ＊2	Maximum resolution
1)	1 to 5 V	1 V	5 V	0 to 12000	0.333 mV
2)	0 to 5 V	0 V	5 V		0.416 mV
3)	–10 to 10 V	0 V	10 V	–16000 to 16000	0.625 mV
4)	0 to 10 V	0 V	10 V	0 to 16000	0.625 mV
—	User range setting	＊1	＊1	–12000 to 12000	0.333 mV

Figure 3.2 Voltage input characteristic in high resolution mode

POINT

(1) Set within the analog input range and digital output range for each input range. If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area shown in Figures 3.1 and 3.2.)

(2) When inputting an analog voltage out of the range between -15 to 15V, the elements may be damaged.

(3) Set the offset/gain values for the user range setting *1 within a range in which the following conditions are met.

(a) Offset value, gain value setting range: -10.0 to 10.0V

(b) Choose either one of the following formulas, which corresponds to the resolution mode to be set.

1) Normal resolution mode: { (Gain value) - (Offset value) } > 1.5V

2) High resolution mode: { (Gain value) - (Offset value) } ≥ 4.0V

(c) { (Gain value) - (Offset value) } ≤ 10.0V

(4) When an analog value that exceeds the range for Digital output value *2 is entered, Digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Normal resolution mode		High resolution mode	
	Minimum	Maximum	Minimum	Maximum
1 to 5 V	–96	4095	–288	12287
0 to 5 V				
–10 to 10 V	–4096		–16384	16383
0 to 10 V	–96		–384	
User range setting	–4096		–12288	12287

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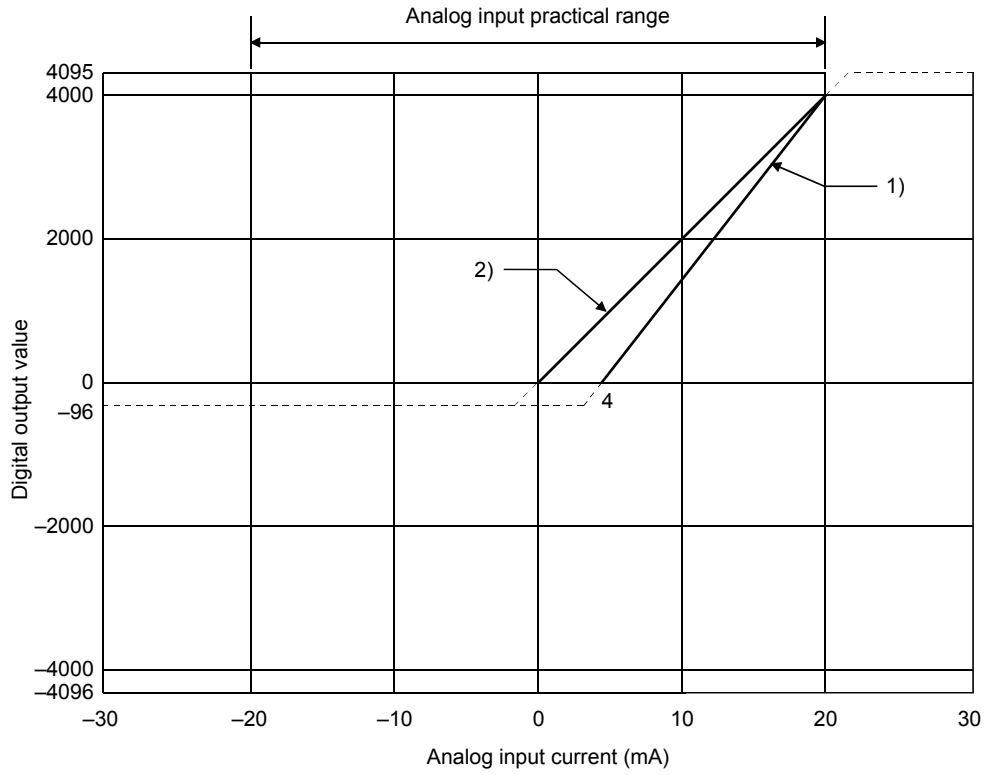
(2) Current input characteristic

(a) Current input characteristic in normal resolution mode

Figure 3.3 shows a graph of the current input characteristic in normal resolution mode.



Number	Analog input range setting	Offset value	Gain value	Digital output value ＊2	Maximum resolution
1)	4 to 20 mA	4 mA	20 mA	0 to 4000	4 μA
2)	0 to 20 mA	0 mA	20 mA		5 μA
—	User range setting	＊1	＊1	–4000 to 4000	1.37 μA

Figure 3.3 Current input characteristic in normal resolution mode

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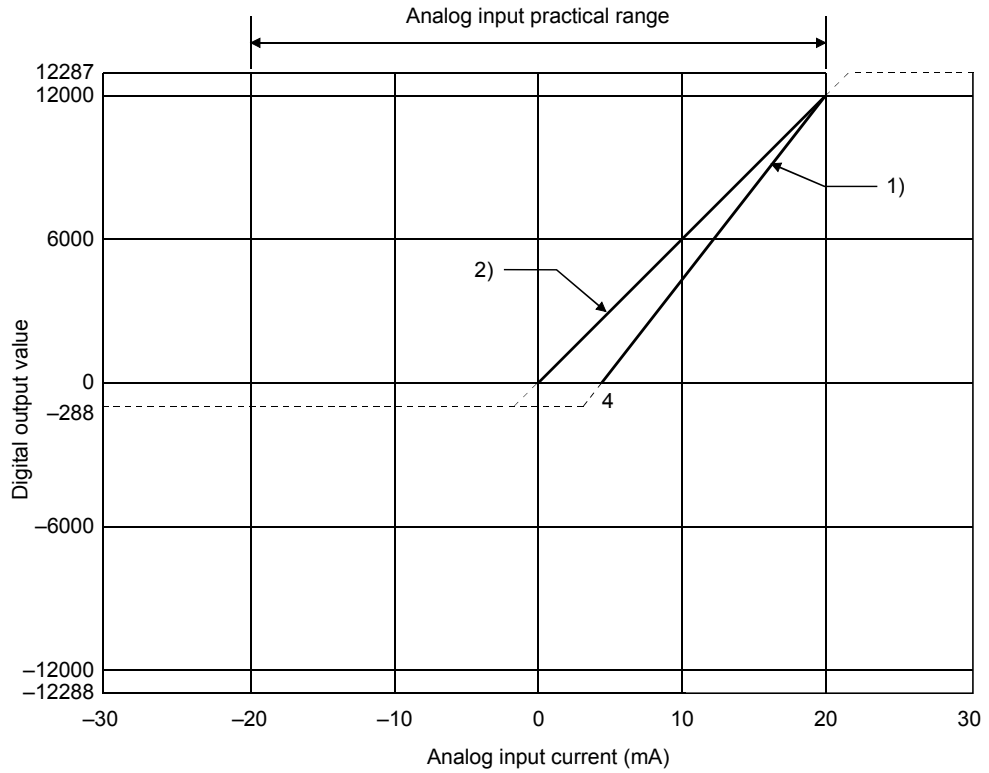
(b) Current input characteristic in high resolution mode
Figure 3.4 shows a graph of the current input characteristic in high resolution mode.



Number	Analog input range setting	Offset value	Gain value	Digital output value ＊2	Maximum resolution
1)	4 to 20 mA	4 mA	20 mA	0 to 12000	1.33 μA
2)	0 to 20 mA	0 mA	20 mA		1.66 μA
—	User range setting	＊1	＊1	–12000 to 12000	1.33 μA

Figure 3.4 Current input characteristic in high resolution mode

POINT

(1) Set within the analog input range and digital output range for each input range. If these ranges are exceeded, the maximum resolution and accuracy may not fall within the performance specifications. (Avoid using the dotted line area shown in Figures 3.3 and 3.4.)

(2) When inputting an analog current out of the range between -30mA to 30mA, the elements may be damaged.

(3) Set the offset/gain values for the user range setting *1 within a range in which the following conditions are met.

(a) Offset value, gain value setting range: -20.0 to 20.0mA

(b) Choose either one of the following formulas, which corresponds to the resolution mode to be set.

1) Normal resolution mode: { (Gain value) - (Offset value) } > 5.5mA

2) High resolution mode: { (Gain value) - (Offset value) } ≥ 16.0mA

(4) When an analog value that exceeds the range of Digital output value *2 is entered, Digital output value will be fixed at the maximum or minimum value.

Analog input range setting	Normal resolution mode		High resolution mode	
	Minimum	Maximum	Minimum	Maximum
4 to 20 mA	–96	4095	–288	12287
0 to 20 mA				
User range setting	–4096		–12288	12287

3.1.3 Accuracy

Accuracy is represented with respect to the maximum value of Digital output value. Accuracy does not change and remains within the range listed in the performance specification even if the input characteristic is changed by changing offset/gain settings, input range and resolution mode.
Figure 3.5 shows the range of fluctuation in accuracy when a -10 to 10V range is selected and in normal resolution mode. Accuracy is ± 0.1% (± 4 digits) when the ambient temperature is 25 ± 5°C, ± 0.3% (± 12 digits) when the ambient temperature is 0 to 55 °C with temperature drift compensation, and ± 0.4% (± 16 digits) when the ambient temperature is 0 to 55 °C without temperature drift compensation.

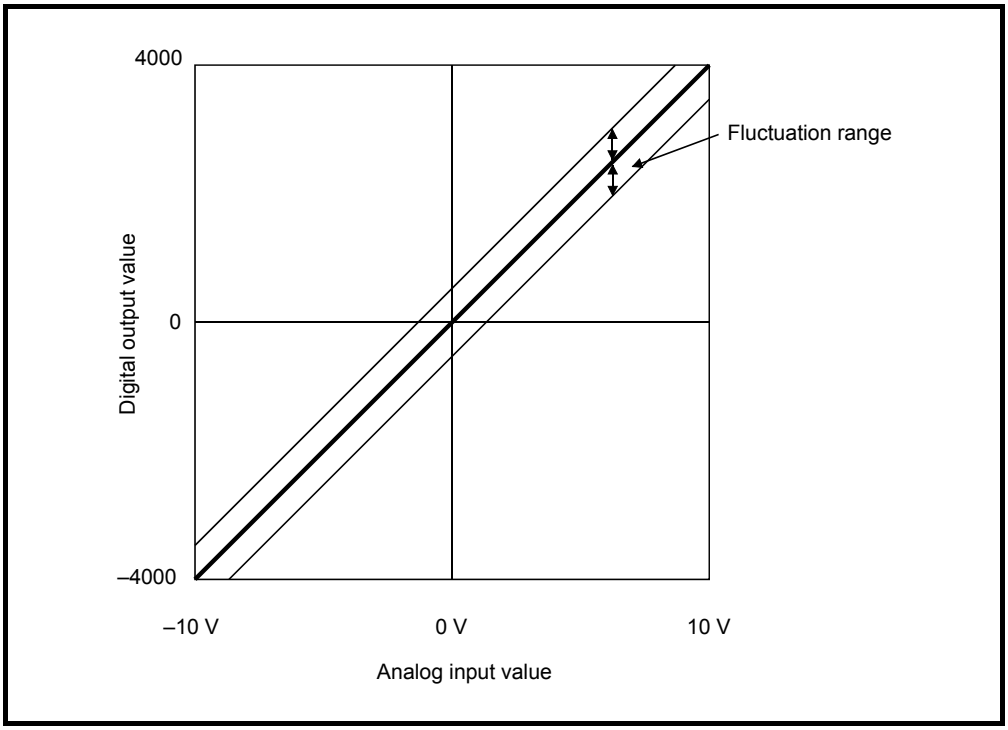


Figure 3.5 Accuracy

3.2 Function List

Table 3.2 shows the function list of the A/D converter modules.

Table 3.2 Function list

Item	Function	Reference section
A/D conversion enable/ disable setting	(1) Specifies whether to enable or disable the A/D conversion for each channel. (2) By disabling the conversion for the channels that are not used, the sampling time can be shortened.	Section 3.4.2
A/D conversion method	(1) Sampling processing The A/D conversion for analog input values is performed successively for each channel, and Digital output value is output upon each conversion. (2) Averaging processing For each channel, A/D conversion values are averaged for the set number of times or set amount of time, and the average value is output as a digital value.	Section 3.2.1
Maximum and minimum value hold function	(1) The maximum and minimum values of Digital output value is retained in the module.	Section 3.2.2
Temperature drift compensation function	(1) Errors arising from changes in the ambient temperature of the module are automatically compensated for to improve conversion accuracy. (2) The temperature drift compensation function can be performed at (A/D conversion time for all channels) + 160 μs.	——
Resolution mode	(1) The resolution mode can be switched according to the application, and digital-value resolution settings of 1/4000, 1/12000 or 1/16000 can be selected. (2) The resolution mode setting is applicable to all channels. (3) Refer to Section 3.1.1 for Digital output value and maximum resolution in normal resolution mode and high resolution mode.	Section 3.1.1 Section 4.5
Online module change	(1) A module change is made without the system being stopped.	Chapter 7

3.2.1 A/D conversion methods

There are two A/D conversion methods, sampling processing and averaging processing.

(1) Sampling processing

A/D conversion is performed successively for the analog input value, and the converted Digital output value is stored in the buffer memory.
The sampling processing time depends on the number of channels used (the number of channels set to A/D conversion enable) and whether the temperature drift compensation function is available.

(a) Without the temperature drift compensation function
(Processing time) = (Number of channels used) $\times$ 80 (μ s/1 channel)

(b) With the temperature drift compensation function
(Processing time) = (Number of channels used) $\times$ 80 (μ s/1 channel) + 160 μ s

[Example]
When three channels (channels 1, 2 and 4) are A/D conversion enabled with the temperature drift compensation function, the sampling processing time is 400 μ s.
3 $\times$ 80 + 160 = 400 (μ s)

(2) Averaging processing

For channels for which averaging processing is specified, A/D conversion is performed for the set number of times or the set amount of time. The average value is calculated from the sum of values excluding the maximum and minimum values, and then stored in the buffer memory.

(a) When averaging processing is specified for the set amount of time

1) The number of processing repetitions within the set time differs according to the number of channels used (number of channels for which A/D conversion is enabled) and whether or not temperature-drift compensation is used.

- Without the temperature drift compensation function

$$\text{(Number of processing repetitions)} = \frac{\text{(Set time)} \times 1000}{\text{(Number of channels used)} \times 80\ (\mu\text{s/1 channel})}$$

- With the temperature drift compensation function

$$\text{(Number of processing repetitions)} = \frac{\text{(Set time)} \times 1000}{\text{(Number of channels used)} \times 80\ (\mu\text{s/1 channel}) + 160}$$

[Example]
When averaging processing is performed with four channels (channels 1, 2, 3, and 4) for the set time of 50 ms with the temperature drift compensation function on, measurement is performed 104 times and the average value is output.

$$\frac{50 \times 1000}{(4 \times 80) + 160} = 104.17 \text{ (times)} \cdots\cdots \text{Round down the number.}$$

2) When 7 or 8 channels are used with the temperature drift compensation function on, set the average time to 3 ms or more.
If the time is set to 2 ms or less, the average number of times becomes less than 3 and it causes Digital output value to become 0 since a sum excluding the maximum and minimum values will be averaged.

(b) When the averaging processing is specified for the set number of times
The time required to store the average value calculated using the average number of times in the buffer memory differs according to the number of channels used (the number of channels set to A/D conversion enable) and whether or not the temperature drift compensation is used.

1) Without the temperature drift compensation function
(Processing time) = (Set number of times) $\times$ {(Number of channels used) $\times$ 80}/1000 (Unit: ms)

2) With the temperature drift compensation function
(Processing time) = (Set number of times) $\times$ [{(Number of channels used) $\times$ 80} + 160]/1000 (Unit: ms)

[Example]
When averaging processing is performed with four channels (1, 2, 3 and 4) for the set number of 100 times with temperature-drift compensation on, an average value is output every 48 ms.
$100 \times \{(4 \times 80) + 160\} \div 1000 = 48$ (ms)

3.2.2 Maximum and minimum value hold function

(1) The maximum and minimum value of Digital output value for each channel are stored in Maximum and minimum values storage area (buffer memory address 30 to 45: Un\G30 to Un\G45).

(2) When Operating condition setting completed flag (X9) turns off, the values are cleared to 0 and new maximum and minimum values are stored when conversion begins.

(3) Since Maximum and minimum values storage area (buffer memory address 30 to 45: Un\G30 to Un\G45) can be rewritten with the sequence program, the maximum and minimum values within a specific period of time can be checked.

3.3 I/O Signals for the Programmable Controller CPU

3.3.1 List of I/O signals

Table 3.3 shows a list of the I/O signals for the A/D converter modules.
Note that I/O numbers (X/Y) shown in this chapter and thereafter are the values when the start I/O number for the A/D converter module is set to 0.

Table 3.3 List of I/O signal

Signal direction CPU ← A/D converter module		Signal direction CPU → A/D converter module	
Device No. (Input)	Signal name	Device No. (Output)	Signal name
X0	Module READY	Y0	Use prohibited ＊1
X1	Temperature drift compensation flag	Y1	
X2	Use prohibited ＊1	Y2	
X3		Y3	
X4		Y4	
X5		Y5	
X6		Y6	
X7		Y7	
X8	High resolution mode status flag	Y8	
X9	Operating condition setting completed flag	Y9	Operating condition setting request
XA	Offset/gain setting mode flag	YA	User range writing request
XB	Channel change completed flag	YB	Channel change request
XC	Use prohibited ＊1	YC	Use prohibited ＊1
XD	Maximum value/minimum value reset completed flag	YD	Maximum value/minimum value reset request
XE	A/D conversion completed flag	YE	Use prohibited ＊1
XF	Error flag	YF	Error clear request

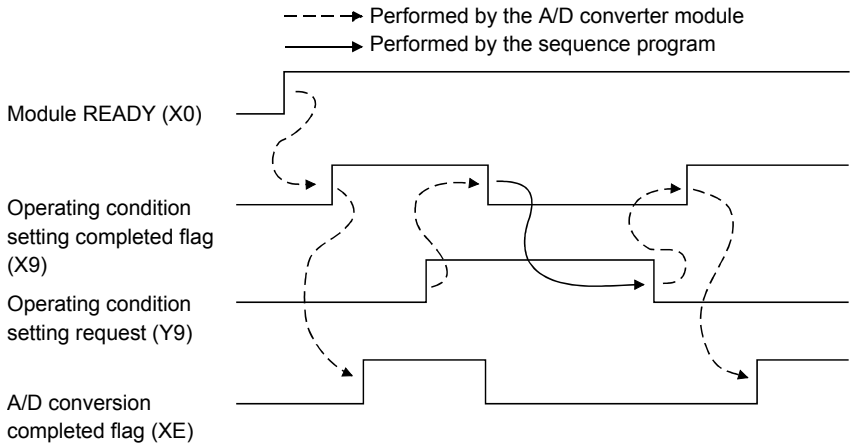
POINT

＊1 These signals cannot be used by the user since they are for system use only. If these are turned on/off by the sequence program, the functioning of the A/D converter module cannot be guaranteed.

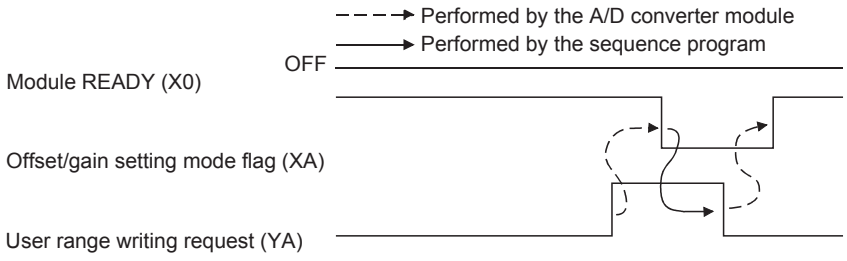
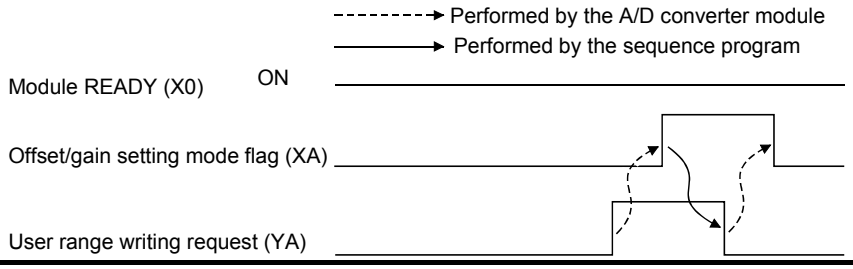
3.3.2 Details of I/O signals

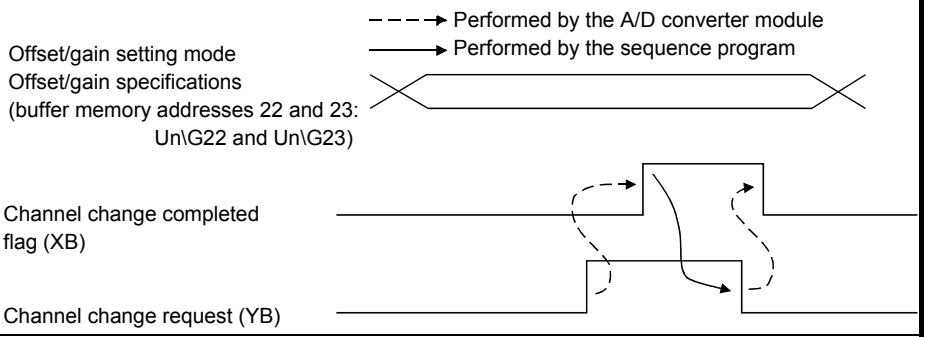
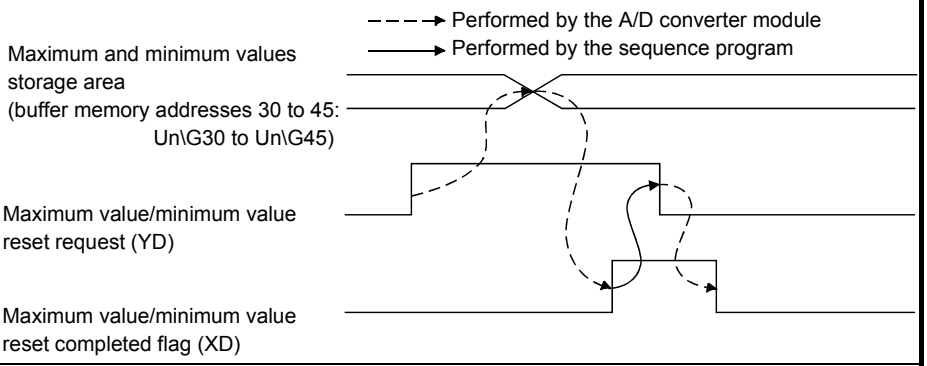
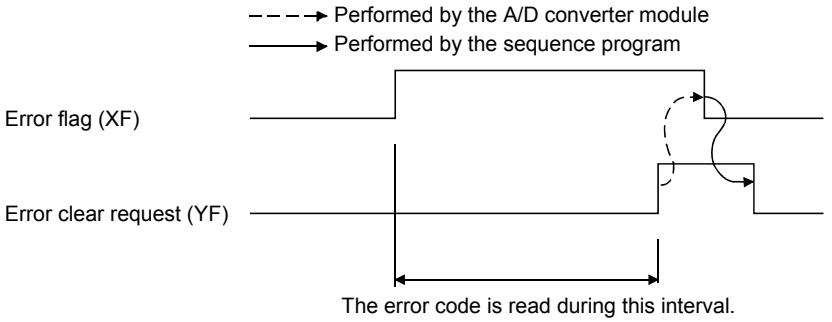
I/O signals for the A/D converter modules are explained in detail below.

(1) Input signals

Device No.	Signal Name	Description
X0	Module READY	(1) When the programmable controller CPU is powered on or reset, this signal turns on once the preparation for A/D conversion has been completed, and A/D conversion processing is then performed. (2) When Module READY signal is off, A/D conversion processing is not performed. Module READY (X0) turns off in the following situations: • During offset/gain setting mode • When the A/D converter module has a watchdog timer error ＊1
X1	Temperature drift compensation flag	(1) When A/D conversion processing is being performed with the temperature drift compensation function on, the flag indicating Temperature drift compensation flag (X1) turns on.
X8	High resolution mode status flag	(1) This turns on when in high resolution mode.
X9	Operating condition setting completed flag	(1) This signal is used as an interlock condition for turning on/off Operating condition setting request (Y9) when the following setting is changed. • A/D conversion enable/disable setting (buffer memory address 0: Un\G0) • CH□ Average time/average number of times (buffer memory address 1 to 8: Un\G1 to Un\G8) • Averaging process setting (buffer memory address 9: Un\G9) (2) When Operating condition setting completed flag (X9) is off, A/D conversion processing is not performed. Under the following conditions, Operating condition setting completed flag (X9) turns off. • When Module READY (X0) is off. • When Operating condition setting request (Y9) is on.  (3) Digital outputs are cleared immediately after Operating condition setting request (Y9) turns on. Therefore, turn on A/D conversion completed flag (XE) before reading digital outputs.

＊1 A watchdog timer error occurs when the program calculations are not completed within the scheduled time due to malfunctions of A/D converter module hardware. When a watchdog timer error occurs, the RUN LED for the A/D converter module turns off.

<table>
<tr><th>Device No.</th><th>Signal Name</th><th>Description</th></tr>
<tr><td rowspan="2">XA</td><td rowspan="2">Offset/gain setting mode flag</td><td>[In offset/gain setting mode]
(1) This is used as an interlock condition for setting User range writing request (YA) to on/off when registering the value after adjustment of the offset/gain settings have been completed.
(2) Refer to Section 4.6 regarding the offset/gain settings.
 
</td></tr>
<tr><td>[In normal mode]
(1) This signal is used as an interlock condition to turn on/off User range writing request (YA) when the user range is restored.
(2) Refer to Chapter 7 for the user range restoration.
 
</td></tr>
</table>

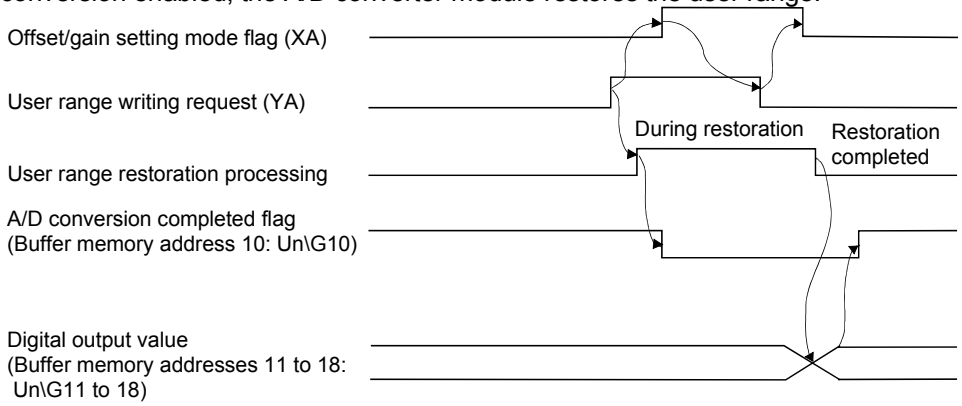
Device No.	Signal name	Description
XB	Channel change completed flag	(1) This is used as an interlock condition for setting Channel change request (YB) to on/off when changing the channel for which the offset/gain settings are to be performed. (2) Refer to Section 4.6 regarding the offset/gain settings. 
XD	Maximum value/minimum value reset completed flag	(1) This signal turns on when the maximum and minimum values stored in Maximum and minimum values storage area (buffer memory address 30 to 45: Un\G30 to Un\G45) are reset by setting Maximum value/minimum value reset request (YD) to on. 
XE	A/D conversion completed flag	(1) This turns on when conversion for all of the channels that are conversion enabled has been completed. (2) When reading the digital output values, use this signal or A/D conversion completed flag (buffer memory address 10: Un\G10) as an interlock.
XF	Error flag	(1) The error flag turns on when a write error occurs. (2) To clear the error code, set Error clear request (YF) to on. 

(2) Output signals

Device No.	Signal name	Description
Y9	Operating condition setting request	(1) Turn on this signal to enable the following setting contents. • A/D conversion enable/disable setting (buffer memory address 0: Un\G0) • CH□ Average time/average number of times (buffer memory address 1 to 8: Un\G1 to Un\G8) • Averaging process setting (buffer memory address 9: Un\G9) (2) Refer to Operating condition setting completed flag (X9) column for on/off timing.
YA	User range writing request	[In offset/gain setting mode] (1) This turns on when the value for the adjusted offset/gain settings are registered in the A/D converter module. (2) Refer to Offset/gain setting mode flag (XA) column for on/off timing. Refer to Section 4.6 for offset/gain settings.
		[In normal mode] (1) This signal turns on when the user range is restored. (2) Refer to Offset/gain setting mode flag (XA) column for on/off timing. Refer to Chapter 7 for user range restoration.
YB	Channel change request	(1) This turns on when changing the channel for which offset/gain settings are to be performed. (2) Refer to Channel change completed flag (XB) column for on/off timing. Refer to Section 4.6 for offset/gain settings.
YD	Maximum value/minimum value reset request	(1) Maximum and minimum values stored in Maximum and minimum values storage area (buffer memory address 30 to 45: Un\G30 to Un\G45) are cleared by setting Maximum value/minimum value reset request (YD) to on. (2) Refer to Maximum value/minimum value reset completed flag (XD) column for on/off timing.
YF	Error clear request	(1) This turns on when a write error is cleared. (2) Refer to Error flag (XF) column for the on/off timing.

POINT

When User range writing request (YA) is turned on in the normal mode with A/D conversion enabled, the A/D converter module restores the user range.


Offset/gain setting mode flag (XA)
User range writing request (YA)
During restoration
Restoration completed
User range restoration processing
A/D conversion completed flag
(Buffer memory address 10: Un\G10)
Digital output value
(Buffer memory addresses 11 to 18: Un\G11 to 18)

During user range restoration: A/D conversion is stopped, A/D conversion completed flag (buffer memory address 10: Un\G10) is off, and digital output value is held as previously.

After user range restoration: A/D conversion is resumed (when user range setting is used, A/D conversion is resumed at the restored offset/gain setting value.)

3.4 Buffer Memory

The detailed explanation of the buffer memory in Section 3.4.4 and later is based on the 8-channel analog input (CH1 to CH8) of the Q68ADV and Q68ADI.

3.4.1 Buffer memory assignment (Q64AD)

This section describes the assignment of the Q64AD buffer memory.

POINT

Do not write data from System area or sequence program to the buffer memory area where writing is disabled. Doing so may cause malfunction.

Table 3.4 Buffer memory assignment (Q64AD) (1/2)

Address		Description	Default	Read/write *1	Reference section
Hexadecimal	Decimal				
0H	0	A/D conversion enable/disable setting	0	R/W	Section 3.4.4
1H	1	CH1 Average time/average number of times	0	R/W	Section 3.4.5
2H	2	CH2 Average time/average number of times	0	R/W	
3H	3	CH3 Average time/average number of times	0	R/W	
4H	4	CH4 Average time/average number of times	0	R/W	
5H	5	System area	—	—	—
to	to				
8H	8				
9H	9	Averaging process setting	0	R/W	Section 3.4.6
AH	10	A/D conversion completed flag	0	R	Section 3.4.7
BH	11	CH1 Digital output value	0	R	Section 3.4.8
CH	12	CH2 Digital output value	0	R	
DH	13	CH3 Digital output value	0	R	
EH	14	CH4 Digital output value	0	R	
FH	15	System area	—	—	—
to	to				
12H	18				
13H	19	Error code	0	R	Section 3.4.9
14H	20	Setting range (CH1 to CH4)	0	R	Section 3.4.10
15H	21	System area	—	—	—
16H	22	Offset/gain setting mode Offset specification	0	R/W	Section 3.4.11
17H	23	Offset/gain setting mode Gain specification	0	R/W	
18H	24	System area	—	—	—
to	to				
1DH	29				
1EH	30	CH1 Maximum value	0	R/W	Section 3.4.12
1FH	31	CH1 Minimum value	0	R/W	
20H	32	CH2 Maximum value	0	R/W	
21H	33	CH2 Minimum value	0	R/W	
22H	34	CH3 Maximum value	0	R/W	
23H	35	CH3 Minimum value	0	R/W	
24H	36	CH4 Maximum value	0	R/W	
25H	37	CH4 Minimum value	0	R/W	

*1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

Table 3.4 Buffer memory assignment (Q64AD) (2/2)

Address		Description	Default	Read/write *1	Reference section
Hexadecimal	Decimal				
26H	38	System area	—	—	—
to	to				
9DH	157				
9EH	158	Mode switching setting	0	R/W	Section 3.4.13
9FH	159				
A0H	160	System area	—	—	—
to	to				
C7H	199				
C8H	200	Pass data classification setting *2	0	R/W	Section 3.4.14
C9H	201	System area	—	—	—
CAH	202	CH1 Industrial shipment settings offset value *2	0	R/W	Section 3.4.15
CBH	203	CH1 Industrial shipment settings gain value *2	0	R/W	
CCH	204	CH2 Industrial shipment settings offset value *2	0	R/W	
CDH	205	CH2 Industrial shipment settings gain value *2	0	R/W	
CEH	206	CH3 Industrial shipment settings offset value *2	0	R/W	
CFH	207	CH3 Industrial shipment settings gain value *2	0	R/W	
D0H	208	CH4 Industrial shipment settings offset value *2	0	R/W	
D1H	209	CH4 Industrial shipment settings gain value *2	0	R/W	
D2H	210	CH1 User range settings offset value *2	0	R/W	
D3H	211	CH1 User range settings gain value *2	0	R/W	
D4H	212	CH2 User range settings offset value *2	0	R/W	
D5H	213	CH2 User range settings gain value *2	0	R/W	
D6H	214	CH3 User range settings offset value *2	0	R/W	
D7H	215	CH3 User range settings gain value *2	0	R/W	
D8H	216	CH4 User range settings offset value *2	0	R/W	
D9H	217	CH4 User range settings gain value *2	0	R/W	

*1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

*2 Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

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3.4.2 Buffer memory assignment (Q68ADV)

This section describes the assignment of the Q68ADV buffer memory.

POINT

Do not write data from System area or sequence program to the buffer memory area where writing is disabled. Doing so may cause malfunction.

Table 3.5 Buffer memory assignment (Q68ADV) (1/3)

Address		Description	Default	Read/write ＊1	Reference section
Hexadecimal	Decimal				
0H	0	A/D conversion enable/disable setting	0	R/W	Section 3.4.4
1H	1	CH1 Average time/average number of times	0	R/W	Section 3.4.5
2H	2	CH2 Average time/average number of times	0	R/W	
3H	3	CH3 Average time/average number of times	0	R/W	
4H	4	CH4 Average time/average number of times	0	R/W	
5H	5	CH5 Average time/average number of times	0	R/W	
6H	6	CH6 Average time/average number of times	0	R/W	
7H	7	CH7 Average time/average number of times	0	R/W	
8H	8	CH8 Average time/average number of times	0	R/W	
9H	9	Averaging process setting	0	R/W	Section 3.4.6
AH	10	A/D conversion completed flag	0	R	Section 3.4.7
BH	11	CH1 Digital output value	0	R	Section 3.4.8
CH	12	CH2 Digital output value	0	R	
DH	13	CH3 Digital output value	0	R	
EH	14	CH4 Digital output value	0	R	
FH	15	CH5 Digital output value	0	R	
10H	16	CH6 Digital output value	0	R	
11H	17	CH7 Digital output value	0	R	
12H	18	CH8 Digital output value	0	R	
13H	19	Error code	0	R	Section 3.4.9
14H	20	Setting range (CH1 to CH4)	0	R	Section 3.4.10
15H	21	Setting range (CH5 to CH8)	0	R	
16H	22	Offset/gain setting mode Offset specification	0	R/W	Section 3.4.11
17H	23	Offset/gain setting mode Gain specification	0	R/W	
18H	24	System area	—	—	—
to	to				
1DH	29				
1EH	30	CH1 Maximum value	0	R/W	Section 3.4.12
1FH	31	CH1 Minimum value	0	R/W	
20H	32	CH2 Maximum value	0	R/W	
21H	33	CH2 Minimum value	0	R/W	
22H	34	CH3 Maximum value	0	R/W	
23H	35	CH3 Minimum value	0	R/W	
24H	36	CH4 Maximum value	0	R/W	
25H	37	CH4 Minimum value	0	R/W	

＊1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

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Table 3.5 Buffer memory assignment (Q68ADV) (2/3)

Address		Description	Default	Read/write *1	Reference section
Hexadecimal	Decimal				
26H	38	CH5 Maximum value	0	R/W	Section 3.4.12
27H	39	CH5 Minimum value	0	R/W	
28H	40	CH6 Maximum value	0	R/W	
29H	41	CH6 Minimum value	0	R/W	
2AH	42	CH7 Maximum value	0	R/W	
2BH	43	CH7 Minimum value	0	R/W	
2CH	44	CH8 Maximum value	0	R/W	
2DH	45	CH8 Minimum value	0	R/W	
2EH	46	System area	—	—	—
to	to				
9DH	157				
9EH	158	Mode switching setting	0	R/W	Section 3.4.13
9FH	159				
A0H	160	System area	—	—	—
to	to				
C9H	201				
CAH	202	CH1 Industrial shipment settings offset value *2	0	R/W	Section 3.4.15
CBH	203	CH1 Industrial shipment settings gain value *2	0	R/W	
CCH	204	CH2 Industrial shipment settings offset value *2	0	R/W	
CDH	205	CH2 Industrial shipment settings gain value *2	0	R/W	
CEH	206	CH3 Industrial shipment settings offset value *2	0	R/W	
CFH	207	CH3 Industrial shipment settings gain value *2	0	R/W	
D0H	208	CH4 Industrial shipment settings offset value *2	0	R/W	
D1H	209	CH4 Industrial shipment settings gain value *2	0	R/W	
D2H	210	CH5 Industrial shipment settings offset value *2	0	R/W	
D3H	211	CH5 Industrial shipment settings gain value *2	0	R/W	
D4H	212	CH6 Industrial shipment settings offset value *2	0	R/W	
D5H	213	CH6 Industrial shipment settings gain value *2	0	R/W	
D6H	214	CH7 Industrial shipment settings offset value *2	0	R/W	
D7H	215	CH7 Industrial shipment settings gain value *2	0	R/W	
D8H	216	CH8 Industrial shipment settings offset value *2	0	R/W	
D9H	217	CH8 Industrial shipment settings gain value *2	0	R/W	
DAH	218	CH1 User range settings offset value *2	0	R/W	
DBH	219	CH1 User range settings gain value *2	0	R/W	
DCH	220	CH2 User range settings offset value *2	0	R/W	
DDH	221	CH2 User range settings gain value *2	0	R/W	

*1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

*2 Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

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Table 3.5 Buffer memory assignment (Q68ADV) (3/3)

Address		Description	Default	Read/write *1	Reference section
Hexadecimal	Decimal				
DE$_H$	222	CH3 User range settings offset value *2	0	R/W	Section 3.4.15
DF$_H$	223	CH3 User range settings gain value *2	0	R/W	
E0$_H$	224	CH4 User range settings offset value *2	0	R/W	
E1$_H$	225	CH4 User range settings gain value *2	0	R/W	
E2$_H$	226	CH5 User range settings offset value *2	0	R/W	
E3$_H$	227	CH5 User range settings gain value *2	0	R/W	
E4$_H$	228	CH6 User range settings offset value *2	0	R/W	
E5$_H$	229	CH6 User range settings gain value *2	0	R/W	
E6$_H$	230	CH7 User range settings offset value *2	0	R/W	
E7$_H$	231	CH7 User range settings gain value *2	0	R/W	
E8$_H$	232	CH8 User range settings offset value *2	0	R/W	
E9$_H$	233	CH8 User range settings gain value *2	0	R/W	

*1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

*2 Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

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3.4.3 Buffer memory assignment (Q68ADI)

This section describes the assignment of the Q68ADI buffer memory.

POINT

Do not write data from System area or sequence program to the buffer memory area where writing is disabled. Doing so may cause malfunction.

Table 3.6 Buffer memory assignment (Q68ADI) (1/3)

Address		Description	Default	Read/write ＊1	Reference section
Hexadecimal	Decimal				
0H	0	A/D conversion enable/disable setting	0	R/W	Section 3.4.4
1H	1	CH1 Average time/average number of times	0	R/W	Section 3.4.5
2H	2	CH2 Average time/average number of times	0	R/W	
3H	3	CH3 Average time/average number of times	0	R/W	
4H	4	CH4 Average time/average number of times	0	R/W	
5H	5	CH5 Average time/average number of times	0	R/W	
6H	6	CH6 Average time/average number of times	0	R/W	
7H	7	CH7 Average time/average number of times	0	R/W	
8H	8	CH8 Average time/average number of times	0	R/W	Section 3.4.6
9H	9	Averaging process setting	0	R/W	Section 3.4.7
AH	10	A/D conversion completed flag	0	R	Section 3.4.8
BH	11	CH1 Digital output value	0	R	
CH	12	CH2 Digital output value	0	R	
DH	13	CH3 Digital output value	0	R	
EH	14	CH4 Digital output value	0	R	
FH	15	CH5 Digital output value	0	R	
10H	16	CH6 Digital output value	0	R	
11H	17	CH7 Digital output value	0	R	
12H	18	CH8 Digital output value	0	R	
13H	19	Error code	0	R	Section 3.4.9
14H	20	Setting range (CH1 to CH4)	0	R	Section 3.4.10
15H	21	Setting range (CH5 to CH8)	0	R	
16H	22	Offset/gain setting mode Offset specification	0	R/W	Section 3.4.11
17H	23	Offset/gain setting mode Gain specification	0	R/W	
18H	24	System area	—	—	—
to	to				
1DH	29				
1EH	30	CH1 Maximum value	0	R/W	Section 3.4.12
1FH	31	CH1 Minimum value	0	R/W	
20H	32	CH2 Maximum value	0	R/W	
21H	33	CH2 Minimum value	0	R/W	
22H	34	CH3 Maximum value	0	R/W	
23H	35	CH3 Minimum value	0	R/W	
24H	36	CH4 Maximum value	0	R/W	
25H	37	CH4 Minimum value	0	R/W	

＊1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

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Table 3.6 Buffer memory assignment (Q68ADI) (2/3)

Address		Description	Default	Read/write *1	Reference section
Hexadecimal	Decimal				
26H	38	CH5 Maximum value	0	R/W	Section 3.4.12
27H	39	CH5 Minimum value	0	R/W	
28H	40	CH6 Maximum value	0	R/W	
29H	41	CH6 Minimum value	0	R/W	
2AH	42	CH7 Maximum value	0	R/W	
2BH	43	CH7 Minimum value	0	R/W	
2CH	44	CH8 Maximum value	0	R/W	
2DH	45	CH8 Minimum value	0	R/W	
2EH	46	System area	—	—	—
to	to				
9DH	157				
9EH	158	Mode switching setting	0	R/W	Section 3.4.13
9FH	159				
A0H	160	System area	—	—	—
to	to				
C9H	201				
CAH	202	CH1 Industrial shipment settings offset value *2	0	R/W	Section 3.4.15
CBH	203	CH1 Industrial shipment settings gain value *2	0	R/W	
CCH	204	CH2 Industrial shipment settings offset value *2	0	R/W	
CDH	205	CH2 Industrial shipment settings gain value *2	0	R/W	
CEH	206	CH3 Industrial shipment settings offset value *2	0	R/W	
CFH	207	CH3 Industrial shipment settings gain value *2	0	R/W	
D0H	208	CH4 Industrial shipment settings offset value *2	0	R/W	
D1H	209	CH4 Industrial shipment settings gain value *2	0	R/W	
D2H	210	CH5 Industrial shipment settings offset value *2	0	R/W	
D3H	211	CH5 Industrial shipment settings gain value *2	0	R/W	
D4H	212	CH6 Industrial shipment settings offset value *2	0	R/W	
D5H	213	CH6 Industrial shipment settings gain value *2	0	R/W	
D6H	214	CH7 Industrial shipment settings offset value *2	0	R/W	
D7H	215	CH7 Industrial shipment settings gain value *2	0	R/W	
D8H	216	CH8 Industrial shipment settings offset value *2	0	R/W	
D9H	217	CH8 Industrial shipment settings gain value *2	0	R/W	
DAH	218	CH1 User range settings offset value *2	0	R/W	
DBH	219	CH1 User range settings gain value *2	0	R/W	
DCH	220	CH2 User range settings offset value *2	0	R/W	
DDH	221	CH2 User range settings gain value *2	0	R/W	

*1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

*2 Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

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Table 3.6 Buffer memory assignment (Q68ADI) (3/3)

Address		Description	Default	R/W ＊1	Reference section
Hexadecimal	Decimal				
DE$_H$	222	CH3 User range settings offset value ＊2	0	R/W	Section 3.4.15
DF$_H$	223	CH3 User range settings gain value ＊2	0	R/W	
E0$_H$	224	CH4 User range settings offset value ＊2	0	R/W	
E1$_H$	225	CH4 User range settings gain value ＊2	0	R/W	
E2$_H$	226	CH5 User range settings offset value ＊2	0	R/W	
E3$_H$	227	CH5 User range settings gain value ＊2	0	R/W	
E4$_H$	228	CH6 User range settings offset value ＊2	0	R/W	
E5$_H$	229	CH6 User range settings gain value ＊2	0	R/W	
E6$_H$	230	CH7 User range settings offset value ＊2	0	R/W	
E7$_H$	231	CH7 User range settings gain value ＊2	0	R/W	
E8$_H$	232	CH8 User range settings offset value ＊2	0	R/W	
E9$_H$	233	CH8 User range settings gain value ＊2	0	R/W	

＊1 Indicates whether reading from and writing to a sequence program are enabled.
R : Read enabled
W : Write enabled

＊2 Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

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3.4.4 A/D conversion enable/disable setting (buffer memory address 0: Un\G0)

(1) Sets whether the output of an A/D conversion value is enabled or disabled for each channel.
(2) It is necessary to set Operating condition setting request (Y9) to on/off in order to enable the setting. (Refer to Section 3.2.2.)
(3) By default, A/D conversion is enabled for all channels.
(4) In the case of the Q64AD module, b4 to b7 (CH5 to CH8) become invalid.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	0	0	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1

For the Q64AD, information for b4 to b15 is fixed at 0,and
for the Q68ADV (I), information for b8 to b15 is fixed at 0.

0 : A/D conversion enabled
1 : A/D conversion disabled

Example

When the channels used for A/D conversion are 1, 3, 5 and 8, 006A$_H$ (106) is stored in buffer memory address 0 (Un\G0).

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0	
0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	006A$_H$ (106)
								CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	
								0		0		6		A		

3.4.5 Average time/average number of times (buffer memory addresses 1 to 8: Un\G1 to Un\G8)

(1) Sets the average time or average number of times for each channel for which averaging processing was specified.
(2) It is necessary to set Operating condition setting request (Y9) to on/off in order to enable the setting. (Refer to Section 3.2.2.)
(3) The setting range is as shown below:
Averaging processing by the number of times: 4 to 62500 ＊1
Averaging processing by time: 2 to 5000 ms
＊1: When number of times in setting range is more than 32768 in a sequence program, set the range in hexadecimal. For example, use F424H for setting of 62500 time.
(4) Zero is set as the default.

POINT

(1) The channel where the value outside the above setting range has been written results in an error, Error code is stored into Error code (buffer memory address 19:Un\G19), Error flag (XF) turns on, and the A/D conversion processing is performed at the pre-error setting.
(2) Since the default setting is 0, change it according to the processing method.
(3) The value, which has been set to the channel specified for sampling processing, is ignored.

3.4.6 Averaging process setting (buffer memory address 9: Un\G9)

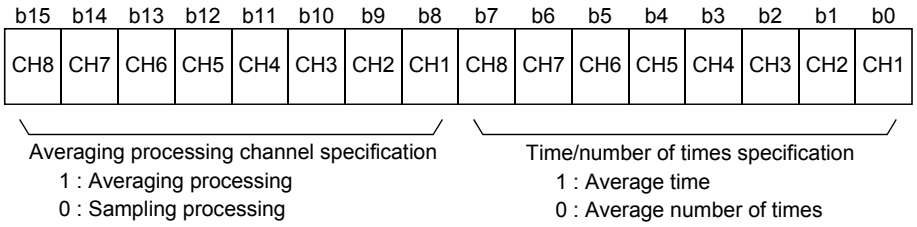
(1) When selecting sampling processing or averaging processing, write the setting to Averaging process setting (buffer memory address 9: Un\G9).

(2) When averaging processing is selected, select average time or average number of times.

(3) It is necessary to set Operating condition setting request (Y9) to on/off in order to enable the setting. (Refer to Section 3.2.2.)

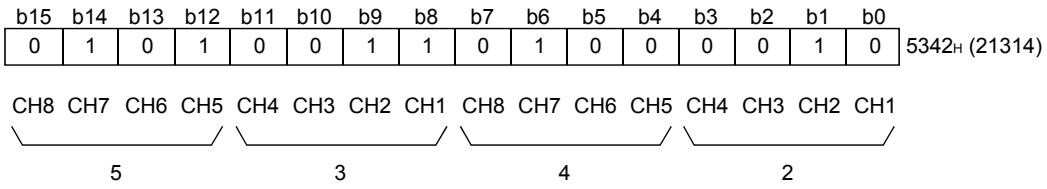
(4) By default, sampling processing is set for all channels.

(5) In the case of the Q64AD module, b4 to b7 and b12 to b15 (CH5 to CH8) are invalid.


b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
CH8 CH7 CH6 CH5 CH4 CH3 CH2 CH1 CH8 CH7 CH6 CH5 CH4 CH3 CH2 CH1
Averaging processing channel specification
1 : Averaging processing
0 : Sampling processing
Time/number of times specification
1 : Average time
0 : Average number of times

Example

To average channels 1 and 5 for the set number of times and channels 2 and 7 for the set amount of time, and to sample-process other channels, store 5342H (21314) in buffer-memory address 9 (Un\G9).



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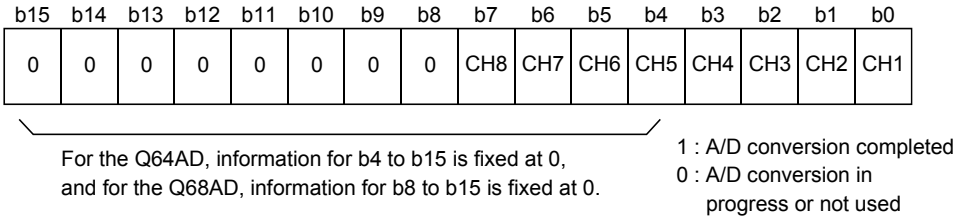
3.4.7 A/D conversion completed flag (buffer memory address 10: Un\G10)

(1) When A/D conversion for the channels enabled for conversion is complete, A/D conversion completed flag is set to 1. A/D conversion completed flag (XE) is set to on when the conversion for all A/D conversion enabled channels is complete.

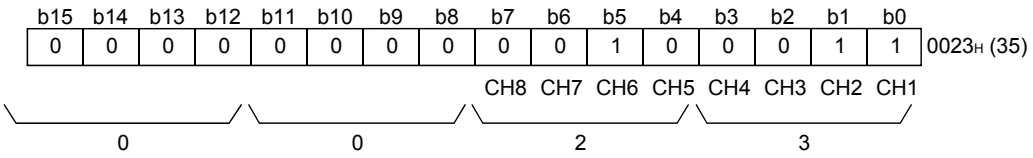
(2) When Operating condition setting request (Y9) is set to on, the flag returns to the default setting of 0 and changes to 1 when A/D conversion is complete.

(3) In the case of the Q64AD module, b4 to b7 (CH5 to CH8) are invalid.


b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
0 0 0 0 0 0 0 0 CH8 CH7 CH6 CH5 CH4 CH3 CH2 CH1
For the Q64AD, information for b4 to b15 is fixed at 0,
and for the Q68AD, information for b8 to b15 is fixed at 0.
1 : A/D conversion completed
0 : A/D conversion in
progress or not used

Example

When A/D conversion is enabled for channels 1, 2 and 6 and all conversions for these channels are complete, 0023_H (35) is stored in A/D conversion completed flag (buffer memory address 10: Un\G10) as shown below.



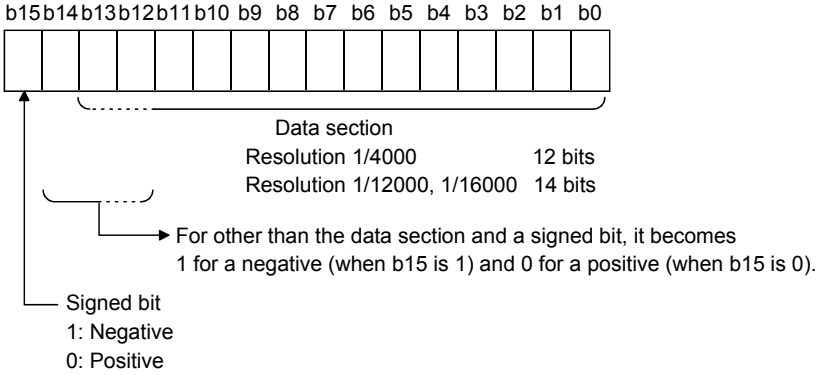
(4) While Operating condition setting request (Y9) is on, 0 is stored to A/D conversion completed flag of all channels.

(5) When reading Digital output value, use this buffer memory area or A/D conversion completed flag (XE) as an interlock.

3.4.8 CH□ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18)

(1) Digital output values after A/D conversion are stored in CH□ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) for each channel.

(2) Digital output value is expressed with 16-bit signed binary values.


b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
Data section
Resolution 1/4000 12 bits
Resolution 1/12000, 1/16000 14 bits
For other than the data section and a signed bit, it becomes
1 for a negative (when b15 is 1) and 0 for a positive (when b15 is 0).
Signed bit
1: Negative
0: Positive

(3) While Operating condition setting request (Y9) is on, 0 is stored to the buffer memory area.

(4) When reading Digital output value, use A/D conversion completed flag (XE) or A/D conversion completed flag (buffer memory address 10: Un\G10) as an interlock.

3.4.9 Error code (buffer memory address 19: Un\G19)

(1) The error codes generated by the A/D converter modules are stored here.

(2) Refer to Section 8.1 for the details of Error code.

3.4.10 Setting range (buffer memory address 20, 21: Un\G20, Un\G21)

(1) These areas are used to confirm Setting range of the A/D converter module.

(2) The setting values for CH1 to CH4 are stored in Setting range (CH1 to CH4) (buffer memory address 20: Un\G20) and setting values for CH5 to CH8 are stored in Setting range (CH5 to CH8) (buffer memory address 21: Un\G21).
For the Q64AD module, Setting range (CH5 to CH8) (buffer memory address 21: Un\G21) is invalid.

	b15 to b12	b11 to b8	b7 to b4	b3 to b0
Un\G20	CH4	CH3	CH2	CH1
Un\G21	CH8	CH7	CH6	CH5

The setting values are as follows.

Input range	Setting value
4 to 20 mA	0H
0 to 20 mA	1H
1 to 5 V	2H
0 to 5 V	3H
–10 to 10 V	4H
0 to 10 V	5H
User range setting	FH

(3) Default setting is 0H.
When the setting for the Q68ADV is 0H, the analog input range operates between 0 to 10V.
(When the setting is 5H, the analog input range will be the same as above.)

POINT

The input range cannot be changed by using Setting range (buffer memory address 20, 21: Un\G20, Un\G21).
For changing the input range, perform by the intelligent function module switch setting. (Refer to Section 4.5.)

3.4.11 Offset/gain setting mode Offset/gain specification (buffer memory address 22, 23: Un\G22, Un\G23)

(1) Specifies the channel to be adjusted for the offset/gain settings.

(2) The channel for which the offset is to be adjusted is specified in Offset/gain setting mode Offset specification (buffer memory address 22: Un\G22) and the channel for which the gain is to be adjusted is specified in Offset/gain setting mode Gain specification (buffer memory address 23: Un\G23).

(3) Although it is possible to set multiple channels at the same time, set the offset and gain separately (Set either Offset/gain setting mode Offset specification (buffer memory address 22: Un\G22) or Offset/gain setting mode Gain specification (buffer memory address 23: Un\G23) to 0). If both are set at the same time, an offset/gain setting mode error (error code 500) occurs.

(4) For Q64AD, b4 to b7 (information for CH5 to CH8) are invalid.

(5) Refer to Section 4.6 for the details of the offset/gain settings.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Un\G22 (Offset specification)	0	0	0	0	0	0	0	0	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1
Un\G23 (Gain specification)	0	0	0	0	0	0	0	0	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1

1 : Channel to be set
0 : Invalid

3.4.12 Maximum and minimum value storage area (buffer memory address 30 to 45: Un\G30 to Un\G45)

(1) The maximum and minimum values of the converted digital value for each channel are stored by each sample processing time (80μs/channel).

(2) The stored values for all channels will be cleared to 0 when Operating condition setting request (Y9) is set to on and the setting is changed or when Maximum value/minimum value reset request (YD) is set to on.

(3) For the channels specified in averaging process, maximum and minimum values of the converted digital values by sampling processing are stored.

3.4.13 Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159)

(1) Set the values of the mode to which you want to switch.

(2) After setting the values, turning Operating condition setting request (Y9) from off to on switches the mode.

(3) When mode switching is performed, this area is cleared to zero and Operating condition setting completed flag (X9) turns off.
After confirming that Operating condition setting completed flag (X9) has turned off, turn off Operation condition setting request (Y9).

Mode to be switched to	Set values	
	Buffer memory address 158	Buffer memory address 159
Normal mode	0964H	4144H
Offset/gain setting mode	4144H	0964H

POINT

If the values written are other than the above, mode switching is not performed and only the operating condition is changed.

3.4.14 Pass data classification setting (buffer memory address 200: Un\G200) (Q64AD only)

(1) Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

(2) Specify whether the offset/gain values to be saved/restored are voltages or currents when saving/restoring the offset/gain values of the user range setting.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	0	0	0	0	0	0	CH4	CH3	CH2	CH1

Data in b4 to b15 are fixed to 0.

1: Current specified
0: Voltage specified

POINT

Refer to Section 4.6 for the offset/gain value setting method.

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3.4.15 Industrial shipment settings and User range settings offset/gain value (buffer memory address 202 to 233: Un\G202 to Un\G233)

(1) Areas used to restore the user range settings offset/gain values when online module change is made.
Refer to chapter 7 for details of online module change.

(2) When the offset/gain values of the user range setting are restored, the used data are stored.
The data are stored (saved) when:
- Initial setting write is performed by the utility;
- The operating condition is set (Operating condition setting request (Y9) turns from off to on ∗1); or
- The offset/gain values are written in the offset/gain setting mode (User range writing request (YA) turns from off to on).

∗1: The data are not saved when values have been written to Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159).

(3) When restoring the offset/gain values of the user range setting, set the data saved here similarly into the corresponding area of the module where the data will be restored.

(4) Buffer memory saving recording procedure for online module change
1) Set Pass data classification setting ∗1 (buffer memory address 200: Un\G200).
2) Turn Operating condition setting request (Y9) from off to on.
3) Compare the offset/gain values of Industrial shipment settings and User range settings (buffer memory addresses 202 to 233: Un\G202 to Un\G233) with the range reference values. Refer to Section 7.4 for the range reference values.
4) If the values are proper, record the offset/gain values of Pass data classification setting ∗1, Industrial shipment settings and User range settings.

∗1: The Q68ADV and Q68ADI do not require the setting and recording of Pass data classification setting.

POINT
Refer to Section 4.6 for the offset/gain value setting method.

4 SETUP AND PROCEDURES BEFORE OPERATION

4.1 Handling Precautions

(1) Do not drop the module or subject it to heavy impact.

(2) Do not remove the PCB of the module from its case. Doing so may cause the module to fail.

(3) Be careful not to let foreign particles such as swarf or wire chips enter the module. They may cause a fire, mechanical failure or malfunction.

(4) The top surface of the module is covered with a protective film to prevent foreign objects such as wire burrs from entering the module during wiring. Do not remove this film until the wiring is complete. Before operating the system, be sure to remove the film to provide adequate ventilation.

(5) Tighten the screws such as module fixing screws within the following ranges. Loose screws may cause short circuits, failures, or malfunctions.

Screw location	Tightening torque range
Module fixing screw (M3 screw) *1	0.36 to 0.48 N · m
Terminal block screw (M3 screw)	0.42 to 0.58 N · m
Terminal block mounting screw (M3.5 screw)	0.66 to 0.89 N · m

*1: The module can be easily fixed onto the base unit using the hook at the top of the module.
However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration.

(6) With pressing the module mounting lever located at the bottom of the module, fully insert the module fixing projection into the fixing hole of the base unit until it stops. Improper installation may result in malfunction, failure, or drop of the module.

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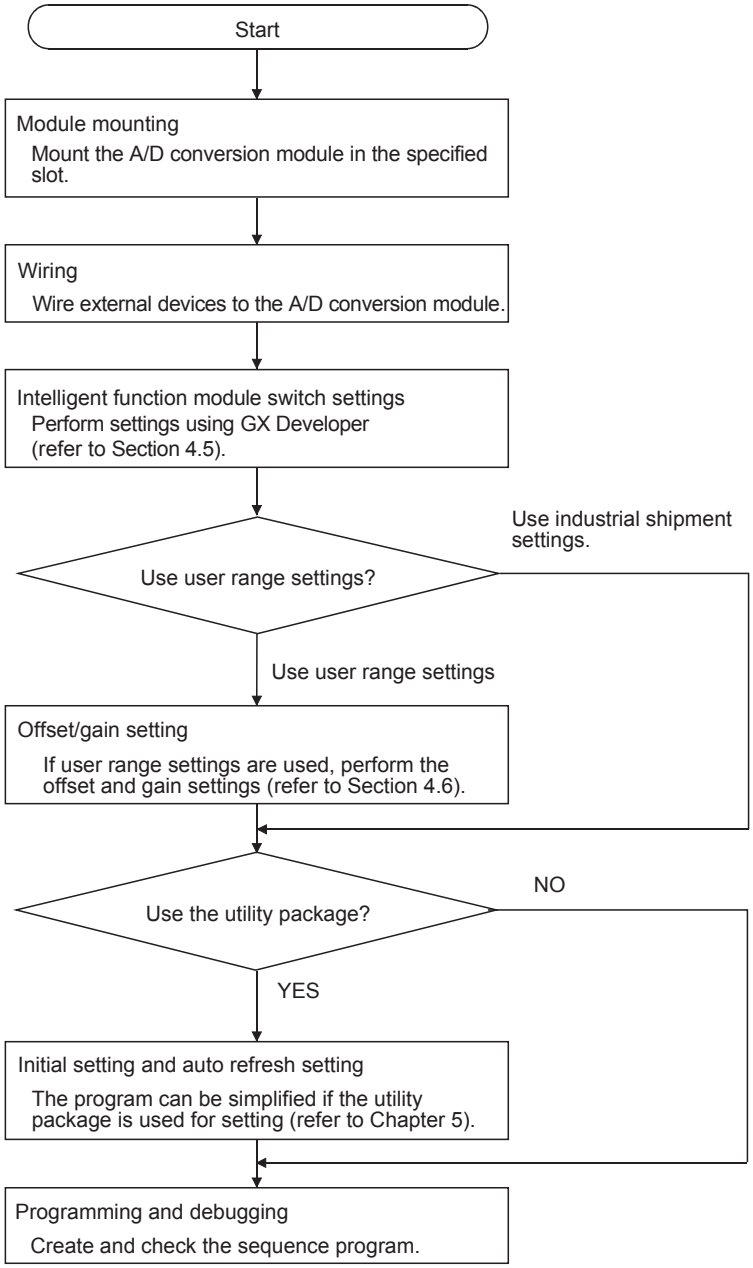
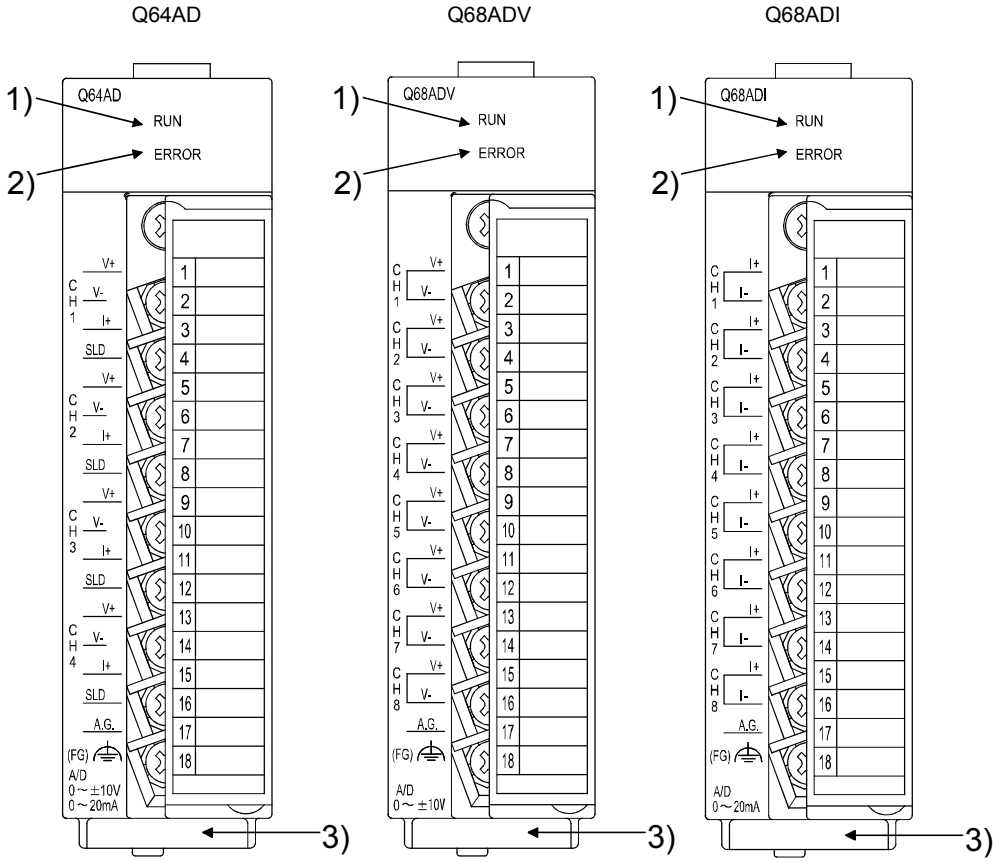
4.2 Setup and Procedures before Operation


Start
Module mounting
Mount the A/D conversion module in the specified slot.
Wiring
Wire external devices to the A/D conversion module.
Intelligent function module switch settings
Perform settings using GX Developer (refer to Section 4.5).
Use industrial shipment settings.
Use user range settings?
Use user range settings
Offset/gain setting
If user range settings are used, perform the offset and gain settings (refer to Section 4.6).
NO
Use the utility package?
YES
Initial setting and auto refresh setting
The program can be simplified if the utility package is used for setting (refer to Chapter 5).
Programming and debugging
Create and check the sequence program.

4.3 Part Identification Nomenclature

The name of each part of the A/D converter module is listed below.



Number	Name and appearance	Description
1)	RUN LED	Displays the operating status of the A/D converter module. On : Normal operation Flashing : During offset/gain setting mode Off : 5V power switched off, watchdog timer error occurred, or online module change enabled
2)	ERROR LED	Displays the error status of the A/D converter module. On : Error ＊1 Off : Normal operation Flashing : Error in switch settings Switch No. 5 of the intelligent function module has been set to a value other than zero "0".
3)	Serial number plate	Indicates the serial No. of the A/D converter module.

＊1 Check Error code for details.

Terminal number	Signal name					
	Q64AD		Q68ADV		Q68ADI	
1	CH1	V +	CH1	V +	CH1	I +
2		V –		V –		I –
3		I +	CH2	V +	CH2	I +
4		SLD		V –		I –
5	CH2	V +	CH3	V +	CH3	I +
6		V –		V –		I –
7		I +	CH4	V +	CH4	I +
8		SLD		V –		I –
9	CH3	V +	CH5	V +	CH5	I +
10		V –		V –		I –
11		I +	CH6	V +	CH6	I +
12		SLD		V –		I –
13	CH4	V +	CH7	V +	CH7	I +
14		V –		V –		I –
15		I +	CH8	V +	CH8	I +
16		SLD		V –		I –
17	A.G. (ANALOG GND)					
18	FG					

4.4 Wiring

The wiring precautions and examples of module connection are provided below.

4.4.1 Wiring precautions

In order to optimize the functions of the A/D converter module and ensure system reliability, external wiring that is protected from noise is required.
Please observe the following precautions for external wiring:

(1) Use separate cables for the AC control circuit and the external input signals of the Q64AD and Q68ADV(I) to avoid the influence of the AC side surges and inductions.

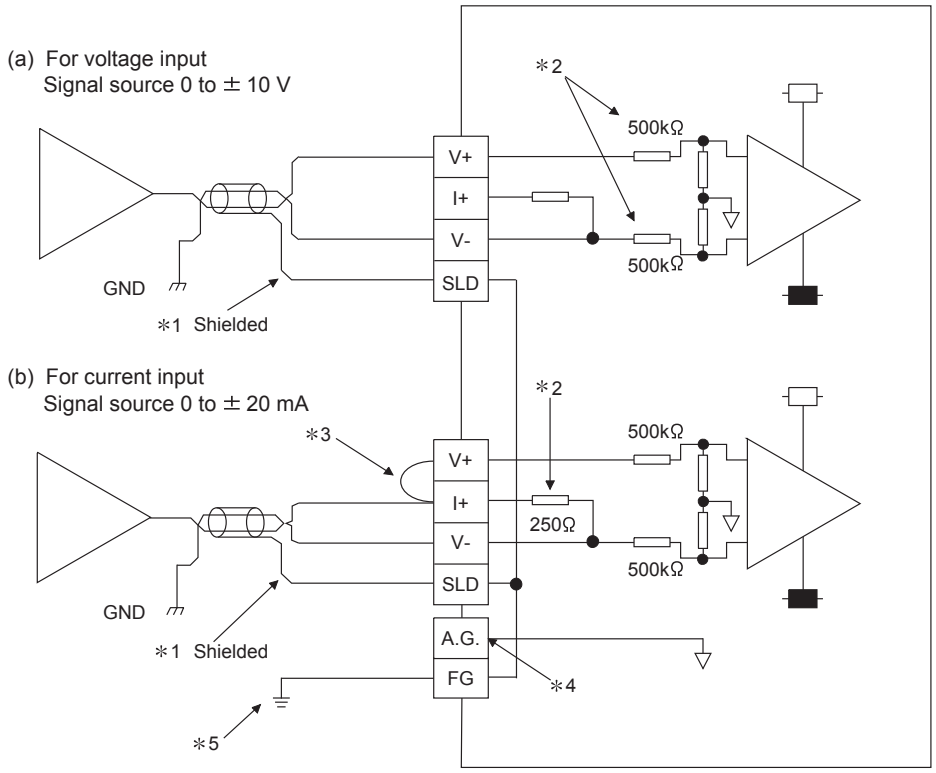
(2) Do not mount the cables close to or bundle them with the main circuit line, a high-voltage cable or a load cable from other than the programmable controller. This may increase the effects of noise, surges and induction.

(3) Perform an one-point grounding for shielded lines and the shields of sealed cables.

(4) A solderless terminal with insulating sleeve cannot be used for the terminal block. Covering the cable-connection portion of the solderless terminal with a marked tube or an insulation tube is recommended.

4.4.2 External wiring

(1) Q64AD

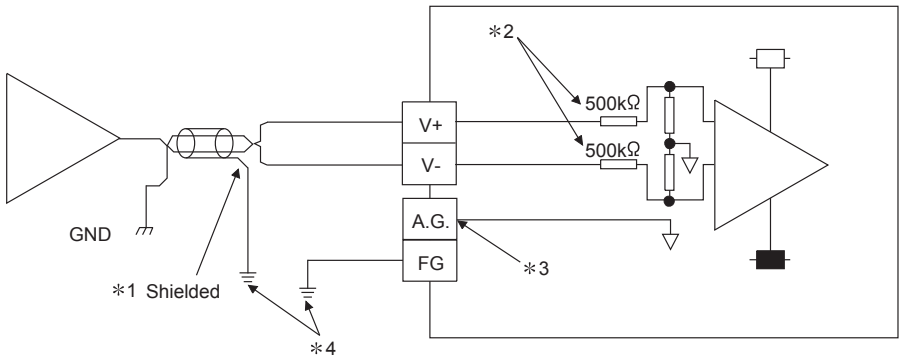


∗1 Use a twisted two core shielded wire for the power wire.
∗2 Shows input resistance of the Q64AD.
∗3 If current input, always connect to (V +) and (I +) terminals.
∗4 "A.G." terminal does not normally require wiring. However, it can be used as GND for external device ground under the following conditions.
(1) When there is a difference in polarity between "A.G." and "GND for external device".
(2) As an alternative for 0 V input when only the + side is open on a ± wire.
∗5 Always use a ground. In addition, ground the FG of the power supply module.

POINT

In an unused channel, if terminals remain open, an erratic digital value may be output.
To prevent this, take any of the following measures.
1. Select Disable in A/D conversion enable/disable setting for the unused channel. Note that changing the setting from Enable to Disable will reduce the sampling time.
2. Short-circuit the input terminals (terminal V+ and V-) of the unused channel.
3. Connect the A.G. terminal to the GND terminal of the external device.

(2) Q68ADV

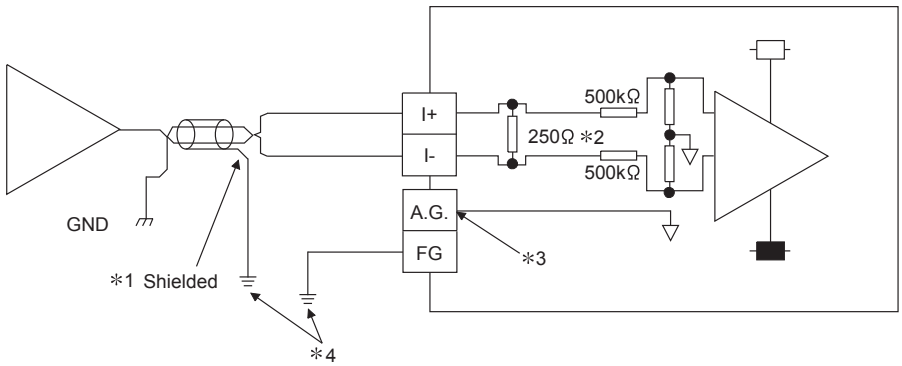


*1 Use a twisted two core shielded wire for the power wire.
*2 Shows input resistance of the Q68ADV.
*3 "A.G." terminal does not normally require wiring. However, it can be used as GND for external device ground under the following conditions.
(1) When there is a difference in polarity between "A.G" and "GND for external device".
(2) As an alternative for 0 V input when only the + side is open on a ± wire.
*4 Always use a ground. In addition, ground the FG of the power supply module.

POINT

In an unused channel, if terminals remain open, an erratic digital value may be output.
To prevent this, take any of the following measures.
1. Select Disable in A/D conversion enable/disable setting for the unused channel. Note that changing the setting from Enable to Disable will reduce the sampling time.
2. Short-circuit the input terminals (terminal V+ and V-) of the unused channel.
3. Connect the A.G. terminal to the GND terminal of the external device.

(3) Q68ADI



*1 Use a twisted two core shielded wire for the power wire.
*2 Shows input resistance of the Q68ADI.
*3 "A.G." terminal does not normally require wiring. However, it can be used as GND for external device ground under the following conditions.
(1) When there is a difference in polarity between "A.G" and "GND for external device".
*4 Always use a ground. In addition, ground the FG of the power supply module.

4.5 Switch Setting for Intelligent Function Module

The settings for the intelligent function module are performed using the I/O assignment settings for GX Developer.

(1) Setting item

The intelligent function module switches consist of switches 1 to 5 and are set using 16 bit data. When the intelligent function module switches are not set, the default value for switches 1 to 5 is 0.

Table 4.1 Switch setting item

<table>
<tr><th></th><th>Setting item</th></tr>
<tr><td>Switch 1</td><td>Input range setting
□□□□ H
CH4 CH3 CH2 CH1</td><td rowspan="2"><table>
<tr><th>Analog input range</th><th>Input range setting value</th></tr>
<tr><td>4 to 20 mA</td><td>0H ＊1</td></tr>
<tr><td>0 to 20 mA</td><td>1H</td></tr>
<tr><td>1 to 5 V</td><td>2H</td></tr>
<tr><td>0 to 5 V</td><td>3H</td></tr>
<tr><td>– 10 to 10 V</td><td>4H</td></tr>
<tr><td>0 to 10 V</td><td>5H</td></tr>
<tr><td>User range setting</td><td>FH</td></tr>
</table></td></tr>
<tr><td>Switch 2</td><td>Input range setting
□□□□ H
CH8 CH7 CH6 CH5</td></tr>
<tr><td>Switch 3</td><td colspan="2">Not used</td></tr>
<tr><td>Switch 4</td><td colspan="2">□□□□ H
00H : With temperature drift correction
01H to FFH (numeric value other than 00H)*2 : Without temperature drift correction
0H : Normal resolution mode
1H to FH (numeric value other than 0H)*2 : High resolution mode
0H : Normal mode (A/D conversion processing)
1H to FH (numeric value other than 0H)*2 : Offset/gain setting mode</td></tr>
<tr><td>Switch 5</td><td colspan="2">0H : Fixed</td></tr>
</table>

＊2 Setting any value within the setting range will provide the same operation.
When the setting range is 1H to FH, set 1H for example.

Depending on the type of module used, the settings for A/D unit input range are shown below.

- Q64AD · · · · · ·0H to 5H, FH
- Q68ADV · · · · ·0H, 2H to 5H, FH

＊1: When the setting is 0H, the input operating range will be 0 t o 10 V.

- Q68ADI · · · · · ·0H, 1H, FH

POINT

(1) If the offset/gain setting mode is set using intelligent function module switch 4, other settings by switch 4 (settings for resolution mode and temperature drift compensation) will be ignored.

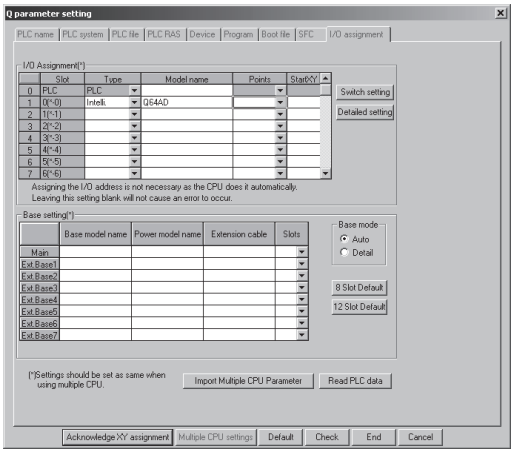
(2) Setting of the offset/gain setting mode differs from function version A to function version B. (Refer to Appendix 1.3)
Perform the offset/gain settings after checking the RUN LED flashes in offset/gain setting mode. If the RUN LED does not flash, check if the switch 4 setting is correct.

(3) Since Digital output value will differ considerably, depending on the resolution mode setting, thoroughly check the settings for the intelligent function module switches before performing the digital output processing.
Example) Digital output value when the setting range is -10 to 10 V and a 10 V analog value is added.

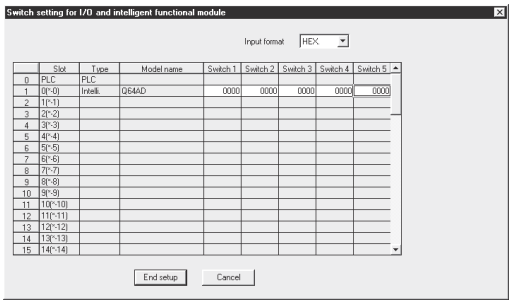
	In normal resolution mode	In high resolution mode
Digital output value	Approximately 4000	Approximately 16000

(2) Operating procedure

Start the settings with GX Developer I/O assignment setting dialog box.



(a) I/O assignment setting
Set the following for the slot in which the A/D converter module is mounted.
The type setting is required; set other items as needed.
Type : Select "intelli."
Model name : Enter the module model name.
Points : Select 16 points.
Start XY : Enter the start I/O number for the A/D converter module.
Detail setting: Specify the control PLC for the A/D converter module.
It is unnecessary to set the "Error time output mode" or "H/W error time PLC operation mode" since these settings are invalid for the A/D converter module.

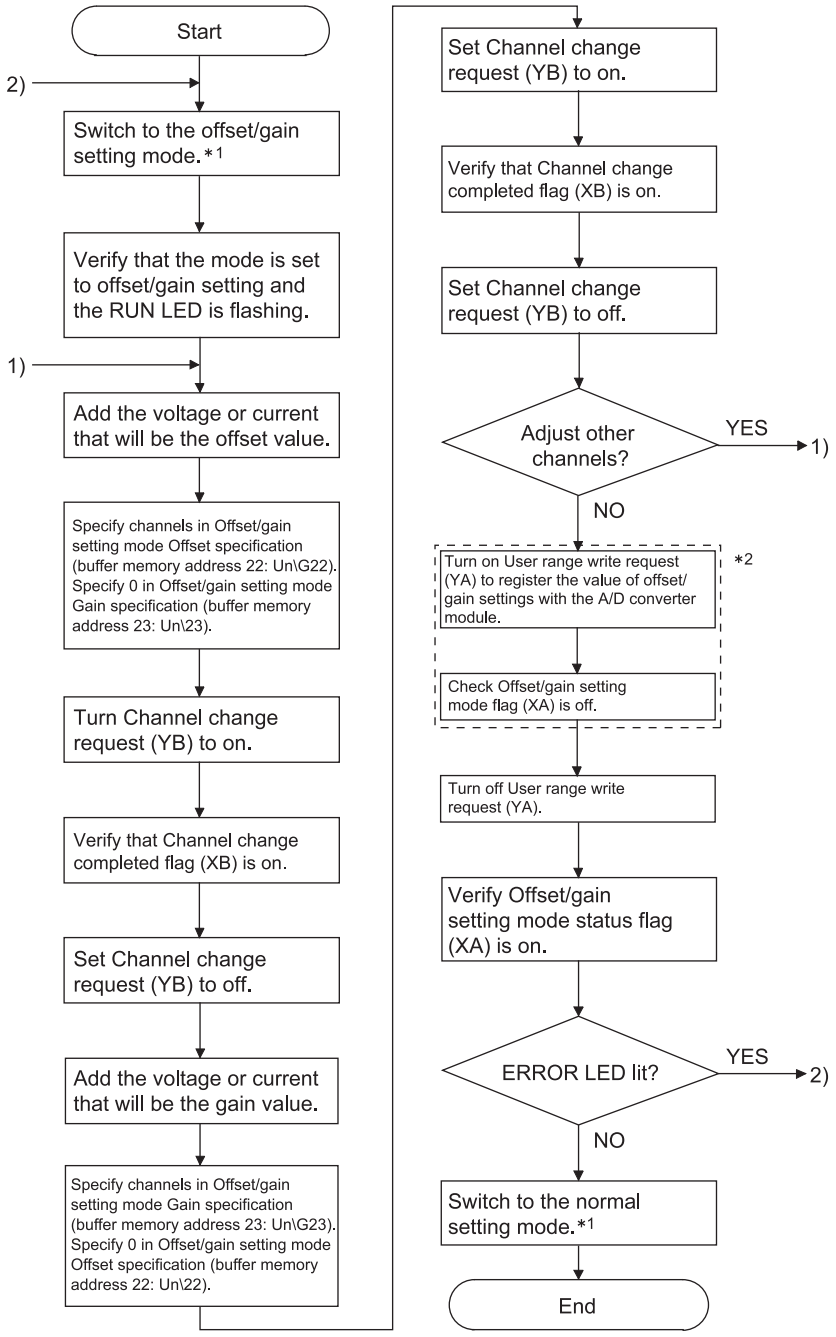


(b) Switch setting for intelligent function module dialog box
Click on [Switch setting] on the I/O assignment setting dialog box to display the dialog box shown at left, then set switches 1 to 5.
The switches can easily be set if values are entered in hexadecimal. Change the entry format to hexadecimal and then enter the values.

4.6 Offset/Gain Settings

When the user range setting is used, perform the offset and gain settings according to the following procedure.
When the industrial shipment setting is used, offset/gain setting is not necessary.
If the utility package is installed, perform the offset/gain settings according to the procedure described in Section 5.6.2.

(1) Offset/gain setting procedure


Start
2)
Switch to the offset/gain setting mode.*1
Verify that the mode is set to offset/gain setting and the RUN LED is flashing.
1)
Add the voltage or current that will be the offset value.
Specify channels in Offset/gain setting mode Offset specification (buffer memory address 22: Un\G22). Specify 0 in Offset/gain setting mode Gain specification (buffer memory address 23: Un\23).
Turn Channel change request (YB) to on.
Verify that Channel change completed flag (XB) is on.
Set Channel change request (YB) to off.
Add the voltage or current that will be the gain value.
Specify channels in Offset/gain setting mode Gain specification (buffer memory address 23: Un\G23). Specify 0 in Offset/gain setting mode Offset specification (buffer memory address 22: Un\22).
Set Channel change request (YB) to on.
Verify that Channel change completed flag (XB) is on.
Set Channel change request (YB) to off.
Adjust other channels?
YES
1)
NO
Turn on User range write request (YA) to register the value of offset/ gain settings with the A/D converter module.
*2
Check Offset/gain setting mode flag (XA) is off.
Turn off User range write request (YA).
Verify Offset/gain setting mode status flag (XA) is on.
ERROR LED lit?
YES
2)
NO
Switch to the normal setting mode.*1
End

∗1 The mode switching (normal mode to offset/gain setting mode to normal mode) method is given below.
- Dedicated instruction (G(P).OFFGAN) ..... Refer to Section 4.6 (2), (a)
- Setting made to Mode switching setting (buffer memory address 158, 159:Un\G158, Un\G159) and turning Operating condition setting request (Y9) from off to on ..... Refer to Section 4.6 (2), (b)
- Intelligent function module switch setting ..... Refer to Section 4.5, Section 4.6 (2), (c) (After intelligent function module switch setting, reset the programmable controller CPU or switch power off, then on.)

∗2 Do not perform the following during ∗2 operation. If performed, an error occurs in E^2PROM data and the A/D converter module may not operate properly.
- Powering off the programmable controller CPU.
- Resetting the programmable controller CPU.

POINT

(1) Perform the offset/gain settings in the range that satisfies the conditions specified in Section 3.1.2, (1) and (2).
When the setting exceeds this range, the maximum resolution or total accuracy may not be within the range indicated in the performance specification.

(2) Though the offset/gain settings can be performed on multiple channels at the same time, set the offset and gain separately (0 at either Offset/gain setting mode Offset specification (buffer memory address 22: Un\G22) or Offset/gain setting mode Gain specification (buffer memory address 23: Un\G23)). If channels are set in Offset/gain setting mode Offset specification (buffer memory address 22: Un\G22) and Offset/gain setting mode Gain specification (buffer memory address 23: Un\G23) at the same time, an error will occur and the ERROR LED will be lit.

(3) After the offset/gain settings are completed, verify that the offset and gain values have been set correctly under actual usage conditions.

(4) The offset and gain values are stored into the E^2PROM and are not erased at power-off.

(5) At the time of offset/gain setting, turn on User range writing request (YA) to write the values to the E^2PROM.
Data can be written to the E^2PROM up to 100 thousand times.
To prevent improper writing to the E^2PROM, an error (error code: 162) occurs when values are written 26 times continuously.

(6) If an error (error code: 40□ ∗1) occurs during offset/gain setting, set the correct offset/gain value again.
The offset/gain value of the channel where the error has occurred is not written to the A/D converter module. (∗1: □indicates the corresponding channel number.)

(7) Module READY (X0) turns from off to on when the offset/gain setting mode switches to the normal mode by the dedicated instruction (G(P).OFFGAN) or the setting of Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159).
Note that initial setting processing will be executed if there is a sequence program that makes initial setting when Module READY (X0) turns on.

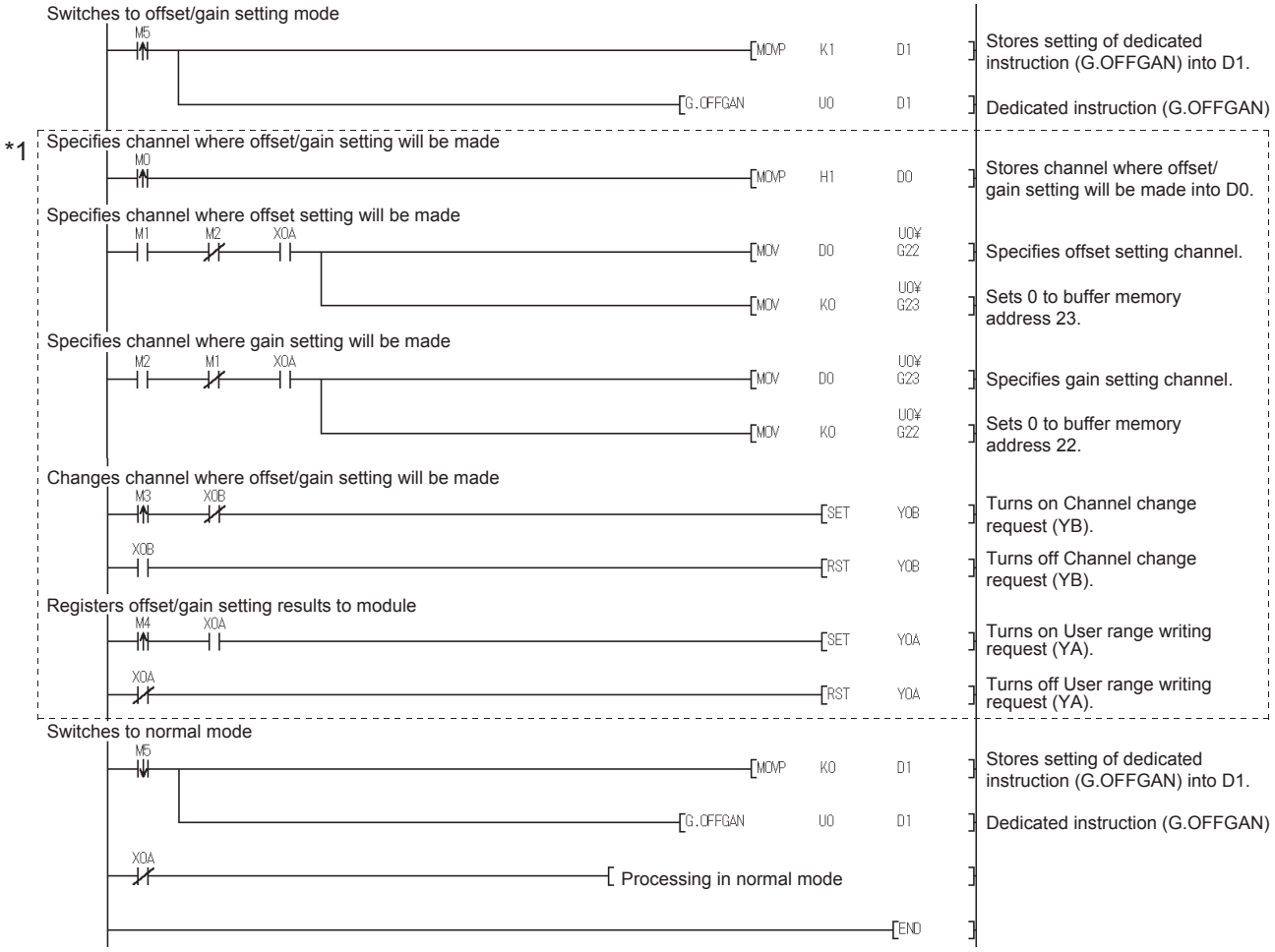
(8) Pass data classification setting (buffer memory address 200: Un\G200) and Industrial shipment settings and user range settings offset/gain values (buffer memory address 202 to 233: Un\G202 to 233) are the areas used to restore offset/gain values of user range settings when online module change is made.
Refer to chapter 7 for details of online module change.

(2) Program examples

The program in the dotted area of (a) is common to (a), (b) and (c).
In this example, the I/O signals for the A/D converter module are X/Y0 to X/YF.

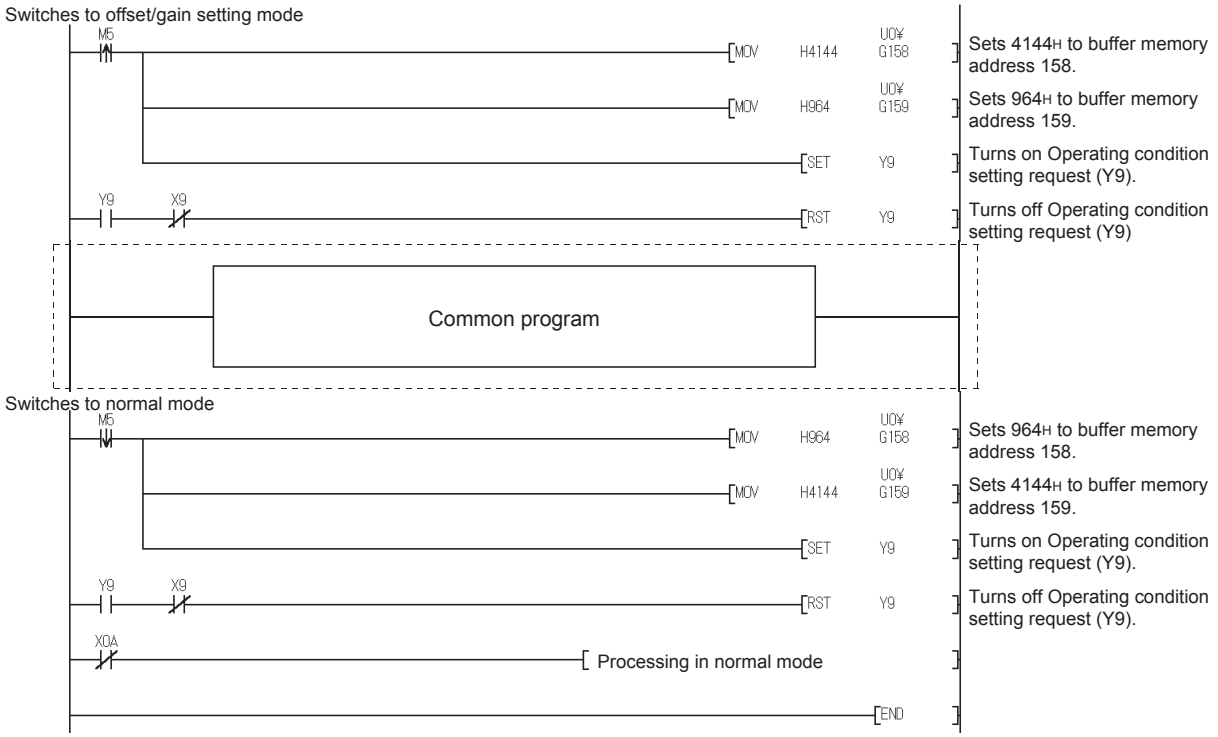
- Channel selection ····· M0
- Offset setting ····· M1
- Gain setting ····· M2
- Channel change command ····· M3
- Offset/gain setting value write command to the module ····· M4
- Mode switching····· M5
- Channel designation storage device····· D0
- Dedicated instruction (G(P).OFFGAN) setting storage device····· D1

(a) When switching the mode using the dedicated instruction (G(P).OFFGAN)
The following program switches to the offset/gain setting mode with the dedicated instruction (G(P).OFFGAN), changes the channel where offset/gain setting will be made, writes the offset/gain values to the A/D converter module, and then switches to the normal mode.


Switches to offset/gain setting mode
M5
MOVP K1 D1
Stores setting of dedicated instruction (G.OFFGAN) into D1.
G.OFFGAN U0 D1
Dedicated instruction (G.OFFGAN)
*1
Specifies channel where offset/gain setting will be made
M0
MOVP H1 D0
Stores channel where offset/ gain setting will be made into D0.
Specifies channel where offset setting will be made
M1 M2 X0A
MOV D0 U0¥G22
Specifies offset setting channel.
MOV K0 U0¥G23
Sets 0 to buffer memory address 23.
Specifies channel where gain setting will be made
M2 M1 X0A
MOV D0 U0¥G23
Specifies gain setting channel.
MOV K0 U0¥G22
Sets 0 to buffer memory address 22.
Changes channel where offset/gain setting will be made
M3 X0B
SET Y0B
Turns on Channel change request (YB).
X0B
RST Y0B
Turns off Channel change request (YB).
Registers offset/gain setting results to module
M4 X0A
SET Y0A
Turns on User range writing request (YA).
X0A
RST Y0A
Turns off User range writing request (YA).
Switches to normal mode
M5
MOVP K0 D1
Stores setting of dedicated instruction (G.OFFGAN) into D1.
G.OFFGAN U0 D1
Dedicated instruction (G.OFFGAN)
X0A
Processing in normal mode
END

*1: The program in the dotted area is a common program.

(b) When switching the mode using Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159) and Operating condition setting request (Y9)



(c) When switching the mode by making intelligent function module switch setting

Only the common program is necessary.

5 UTILITY PACKAGE (GX Configurator-AD)

5.1 Utility Package Functions

Table 5.1 shows an overview of the utility package functions.

Table 5.1 Utility package (GX Configurator-AD) function list

Item	Description	Reference section
Initial Setting ＊1	(1) Sets the following items that require initial setting. • CH A/D conversion enable/disable setting • CH Averaging process setting • CH Time/number of times specifying • CH Average time/average number of times setting (2) The data for which initial setting has been completed is registered in the parameters for the programmable controller CPU, and automatically written to the A/D converter module when the programmable controller CPU changes to the RUN status.	Section 5.4
Auto Refresh Settings ＊1	(1) Sets auto refresh for the A/D converter module buffer memory. (2) The buffer memory that was set for auto refresh is automatically read and written to the specified device when the END command for the programmable controller CPU is executed.	Section 5.5
Monitor/test	(1) Monitor/test The buffer memory and I/O signals for the A/D converter modules are monitored and tested. (2) Operating condition setting Changes the initial setting during operation. (3) Offset/gain setting When setting the offset/gain to a value selected by the user (when the analog output range setting is user range setting), the offset and gain can be easily set while viewing the screen. (4) Pass data The pass data (pass data classification setting, industrial shipment settings offset/gain values, user range settings offset/gain values) can be monitored and set.	Section 5.6
FB conversion	Generates FB automatically from the intelligent function module parameter (initial setting/auto refresh setting).	Section 5.7

POINT

＊1 If initial setting and auto refresh setting are performed, the intelligent function module parameters require a maximum of 76 bytes per module.

5.2 Installing and Uninstalling the Utility Package

For how to install or uninstall the utility package, refer to "Method of installing the MELSOFT Series" included in the utility package.

5.2.1 Handling precautions

The following explains the precautions on using GX Configurator-AD.

(1) For safety

Since GX Configurator-AD is add-in software for GX Developer, read "Safety Precautions" and the basic operating procedures in the GX Developer Operating Manual.

(2) About installation

GX Configurator-AD is add-in software for GX Developer Version 4 or later. Therefore, GX Configurator-AD must be installed on the personal computer that has already GX Developer Version 4 or later installed.

(3) Screen error of Intelligent function module utility

Insufficient system resource may cause the screen to be displayed inappropriately while using the Intelligent function module utility.
If this occurs, close the Intelligent function module utility, GX Developer (program, comments, etc.), and other applications, and then start GX Developer and Intelligent function module utility again.

(4) To start the Intelligent function module utility

(a) In GX Developer, select "QCPU (Q mode)" for PLC series and specify a project.
If any PLC series other than "QCPU (Q mode)" is selected, or if no project is specified, the Intelligent function module utility will not start.

(b) Multiple Intelligent function module utilities can be started.
However, [Open parameters] and [Save parameters] operations under [Intelligent function module parameter] are allowed for one Intelligent function module utility only. Only the [Monitor/test] operation is allowed for the other utilities.

(5) Switching between two or more Intelligent function module utilities

When two or more Intelligent function module utility screens cannot be displayed side by side, select a screen to be displayed on the top of others using the task bar.

(6) Number of parameters that can be set in GX Configurator-AD

When multiple intelligent function modules are mounted, the number of parameter settings must not exceed the following limit.

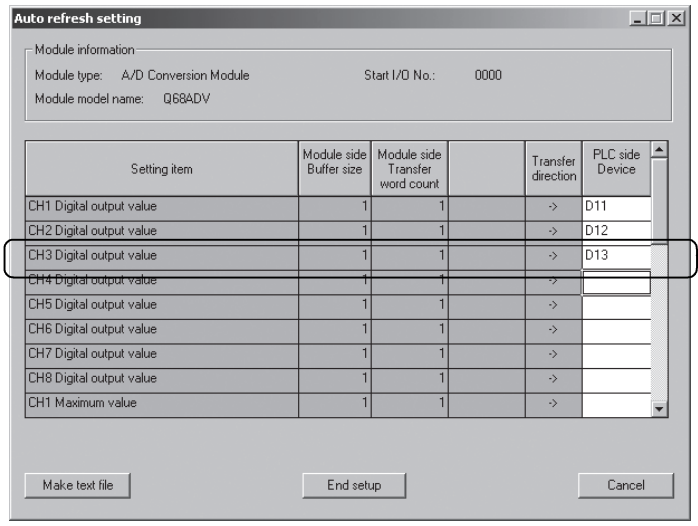
When intelligent function modules are installed to:	Maximum number of parameter settings	
	Initial setting	Auto refresh setting
Q00J/Q00/Q01CPU	512	256
Q02/Q02H/Q06H/Q12H/Q25HCPU	512	256
Q02PH/Q06PH/Q12PH/Q25PHCPU	512	256
Q12PRH/Q25PRHCPU	512	256
Q00UJ/Q00U/Q01UCPU	512	256
Q02UCPU	2048	1024
Q03UD/Q04UDH/Q06UDH/Q10UDH/Q13UDH/ Q20UDH/Q26UDH/Q03UDE/Q04UDEH/ Q06UDEH/Q10UDEH/Q13UDEH/Q20UDEH/ Q26UDEHCPU	4096	2048
MELSECNET/H remote I/O station	512	256

For example, if multiple intelligent function modules are installed to the MELSECNET/H remote I/O station, configure the settings in GX Configurator-AD so that the number of parameter settings for all the intelligent function modules does not exceed the limit of the MELSECNET/H remote I/O station. Calculate the total number of parameter settings separately for the initial setting and for the auto refresh setting.

The number of parameters that can be set for one module in GX Configurator-AD is as shown below.

Target module	Initial setting	Auto refresh setting
Q64AD	2 (Fixed)	13 (Max.)
Q68ADV/ADI	2 (Fixed)	25 (Max.)

Example) Counting the number of parameter settings in Auto refresh setting



This one row is counted as one setting.
Blank rows are not counted.
Count up all the setting items on this screen, and add the total to the number of settings for other intelligent function modules to get a grand total.

5.2.2 Operating environment

This section explains the operating environment of the personal computer that runs GX Configurator-AD.

Item		Description
Installation (Add-in) target ＊1		Add-in to GX Developer Version 4 (English version) or later ＊2
Computer		A personal computer with any of the operating systems below
	CPU	Refer to the next page "Operating system and performance required for personal computer".
	Required memory	
Hard disk space	For installation	65 MB or more
	For operation	20 MB or more
Display		800 × 600 dots or more resolution ＊3
Operating system		Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) SP1 or later Microsoft® Windows® XP Home Edition Operating System (English version) SP1 or later Microsoft® Windows Vista® Home Basic Operating System (English version) Microsoft® Windows Vista® Home Premium Operating System (English version) Microsoft® Windows Vista® Business Operating System (English version) Microsoft® Windows Vista® Ultimate Operating System (English version) Microsoft® Windows Vista® Enterprise Operating System (English version) Microsoft® Windows® 7 Starter Operating System (English version) ＊4 Microsoft® Windows® 7 Home Premium Operating System (English version) ＊4 Microsoft® Windows® 7 Professional Operating System (English version) ＊4 Microsoft® Windows® 7 Ultimate Operating System (English version) ＊4 Microsoft® Windows® 7 Enterprise Operating System (English version) ＊4

＊1: Install GX Configurator-AD in GX Developer Version 4 or higher in the same language.
GX Developer (English version) and GX Configurator-AD (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-AD (English version) cannot be used in combination.

＊2: GX Configurator-AD is not applicable to GX Developer Version 3 or earlier.
In addition, GX Developer Version 8 or later is necessary to use the FB conversion function.

＊3: When Windows Vista® or Windows® 7 is used, resolution of 1024 × 768 dots or more is recommended.

＊4: When 32-bit Windows® 7 is used, add GX Configurator-AD Version 2.11M or later in GX Developer Version 8.91V or later.
When 64-bit Windows® 7 is used, add GX Configurator-AD Version 2.11M or later in GX Developer Version 8.98C or later.

Operating system and performance required for personal computer

Operating system	Performance required for personal computer	
	CPU	Memory
Windows® 95	Pentium® 133MHz or more	32MB or more
Windows® 98	Pentium® 133MHz or more	32MB or more
Windows® Me	Pentium® 150MHz or more	32MB or more
Windows NT® Workstation 4.0	Pentium® 133MHz or more	32MB or more
Windows® 2000 Professional	Pentium® 133MHz or more	64MB or more
Windows® XP	Pentium® 300MHz or more	128MB or more
Windows Vista®	Pentium® 1GHz or more	1GB or more
Windows® 7	Pentium® 1GHz or more	1GB or more (32-bit) 2GB or more (64-bit)

POINT

- The functions shown below are not available for Windows® XP, Windows Vista®, and Windows® 7.
  If any of the following functions is attempted, this product may not operate normally.
  Start of application in Windows® compatible mode
  Fast user switching
  Remote desktop
  Large fonts (Details setting of Display Properties)
  DPI setting other than 100%
  Also, GX Configurator-AD is not supported by 64-bit Windows® XP and 64-bit Windows Vista®.
- A user with USER authority or higher can access GX Configurator-AD for Windows Vista® and Windows® 7.
- When Windows® 7 is used, the following functions are not available.
  Windows XP Mode
  Windows Touch

5.3 Utility Package Operation

5.3.1 Common utility package operations

(1) Control keys

Special keys that can be used for operation of the utility package and their applications are shown in the table below.

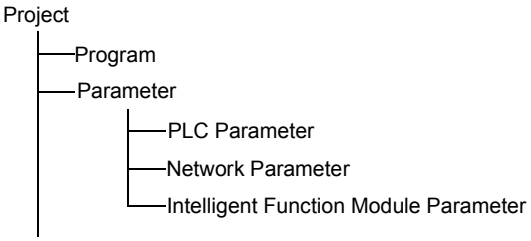
Key	Application
Esc	Cancels the current entry in a cell. Closes the window.
Tab	Moves between controls in the window.
Ctrl	Used in combination with the mouse operation to select multiple cells for test execution.
Delete	Deletes the character where the cursor is positioned. When a cell is selected, clears all of the setting contents in the cell.
Back Space	Deletes the character where the cursor is positioned.
↑ ↓ ← →	Moves the cursor.
Page Up	Moves the cursor one page up.
Page Down	Moves the cursor one page down.
Enter	Completes the entry in the cell.

(2) Data created with the utility package

The following data or files that are created with the utility package can be also handled in GX Developer. Figure 5.1 shows respective data or files are handled in which operation.

(a) Intelligent function module parameter

This represents the data created in Auto refresh setting, and they are stored in an intelligent function module parameter file in a project created by GX Developer.



(b) Text files

A text file can be created by clicking the Make text file button on the initial setting, Auto refresh setting, or Monitor/Test screen. The text files can be utilized to create user documents.

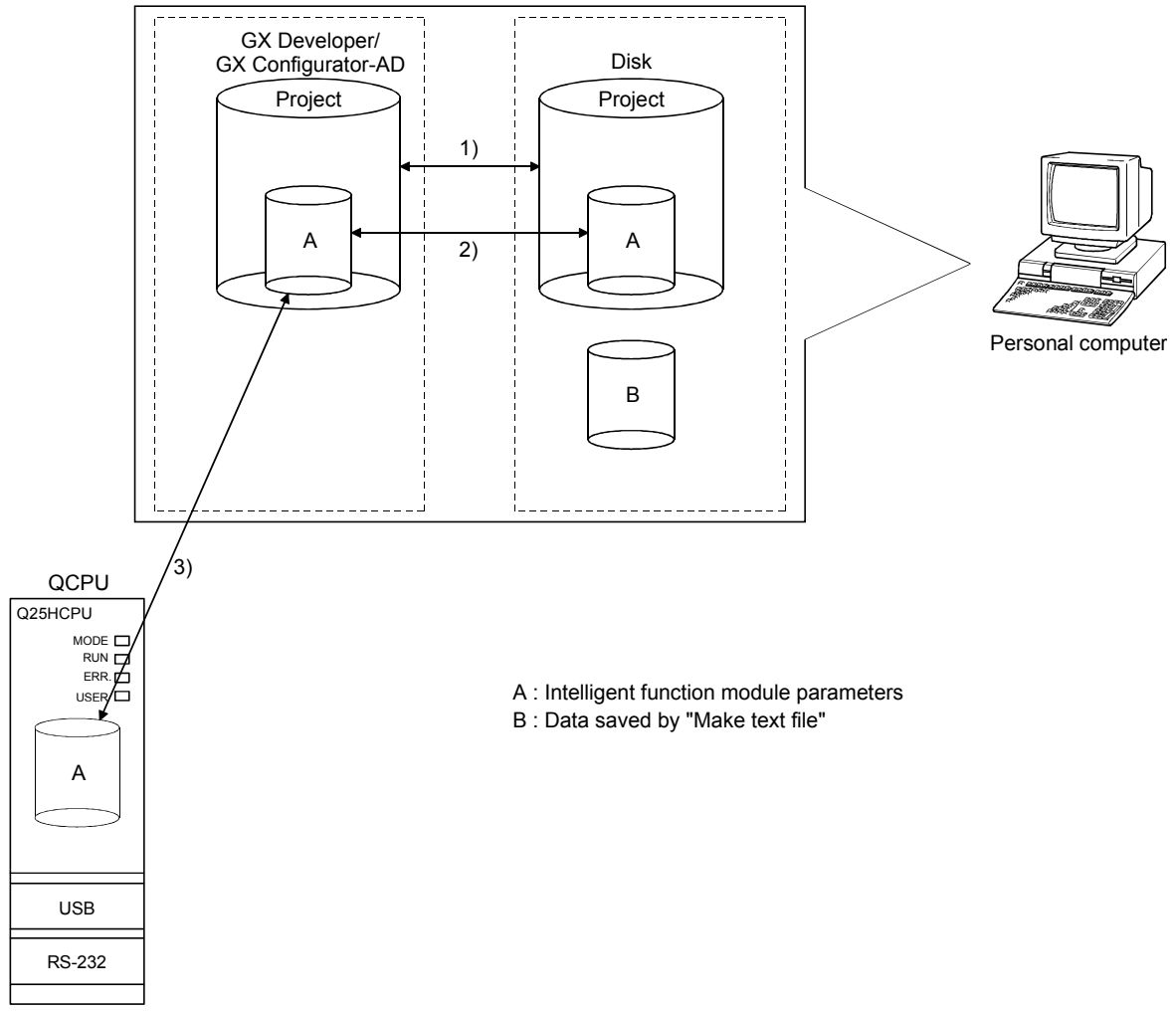


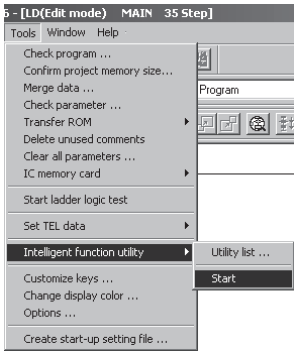
Figure 5.1 Correlation chart for data created with the utility package

Steps 1) to 3) shown in Figure 5.1 are performed as follows:

1) From GX Developer, select:
   [Project] → [Open project] / [Save]/ [Save as]
2) On the intelligent function module selection screen of the utility, select:
   [Intelligent function module parameter] → [Open parameters] / [Save parameters]
3) From GX Developer, select:
   [Online] → [Read from PLC] / [Write to PLC] → "Intelligent function module parameters"
   Alternatively, from the intelligent function module selection screen of the utility, select:
   [Online] → [Read from PLC] / [Write to PLC]

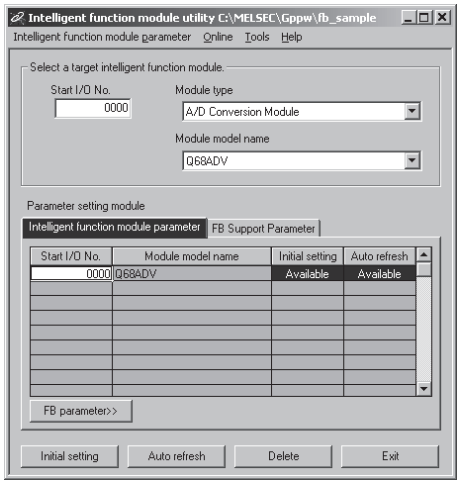
5.3.2 Operation overview

GX Developer screen



[Tools] – [Intelligent function utility] – [Start]

Screen for selecting a target intelligent function module



See Section 5.3.3

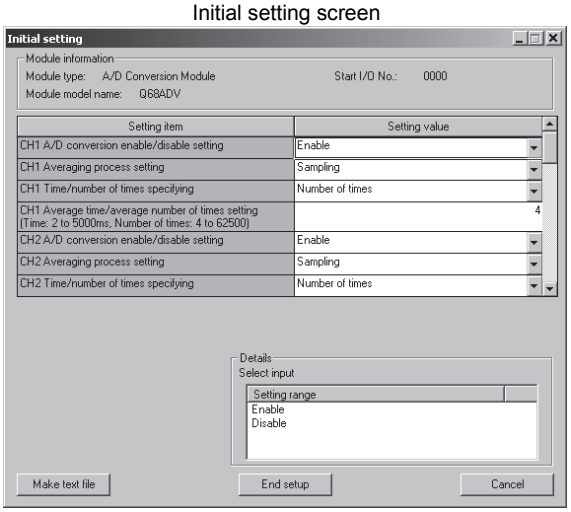
Enter "Start I/O No.", and select "Module type" and "Module model name".

1)

Initial setting

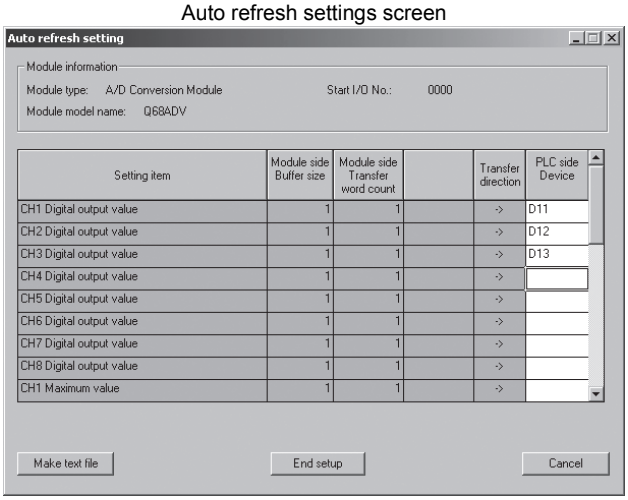
Auto refresh

Initial setting screen



See Section 5.4

Auto refresh settings screen



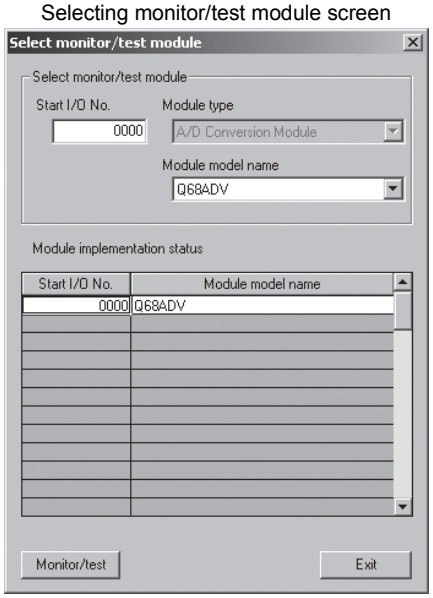
See Section 5.5

1)

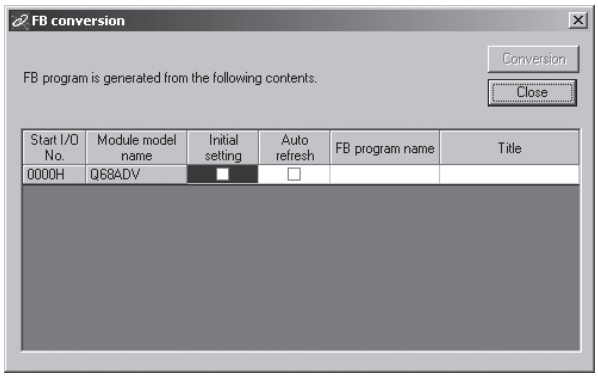
[Online] [Monitor/Test]

<<FB support parameter>> tab – FB conversion

Selecting monitor/test module screen



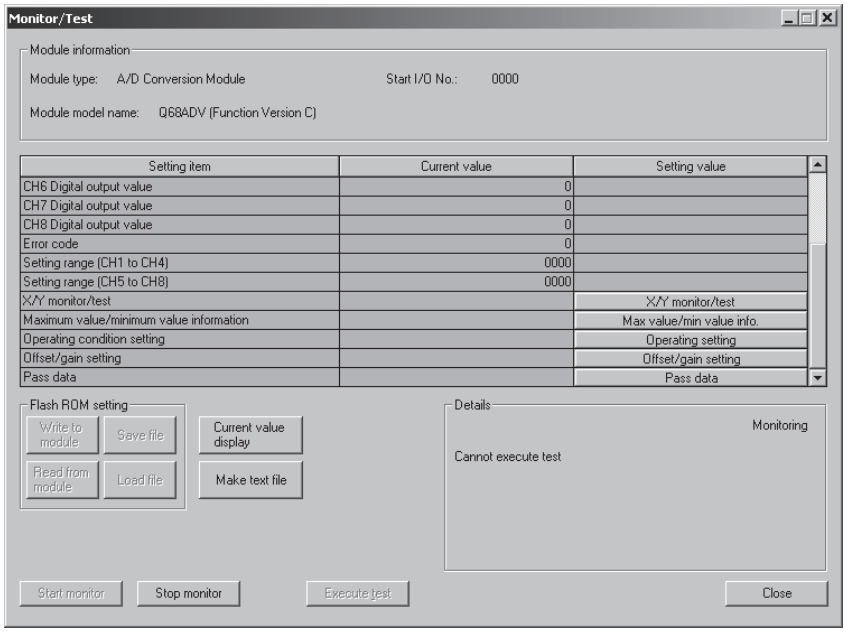
FB conversion screen



See Section 5.7

Select a module to be monitored/tested.

Monitor/Test screen



See Section 5.6

5.3.3 Starting the intelligent function module utility

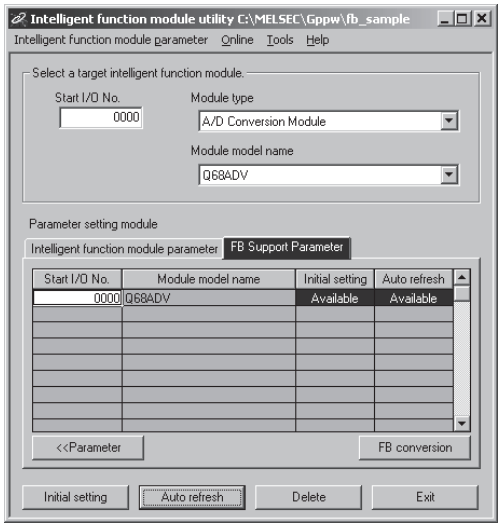
[Operating procedure]

Intelligent function module utility is started from GX Developer.

[Tools] → [Intelligent function utility] → [Start]

[Setting screen]

Display when the <<FB support parameter>> tab is selected



[Explanation of items]

(1) Activation of other screens

Following screens can be displayed from the intelligent function module utility screen.

Common operations to the <<Intelligent function module parameter>> tab and <<FB support parameter>> tab

(a) Initial setting screen

"Start I/O No.＊1" → "Module type" → "Module model name" →

Initial setting

(b) Auto refresh setting screen

"Start I/O No.＊1" → "Module type" → "Module model name" →

Auto refresh

(c) Select monitor/test module screen

[Online] → [Monitor/Test]

＊1: Enter the start I/O No. in hexadecimal.

On the <<FB support parameter>> tab

(a) FB conversion screen

<<FB support parameter>> tab → FB conversion

For details, refer to section 5.7.

POINT

The <<FB support parameter>> tab is displayed when the project which is being edited is a label project.

(2) Command buttons

Common operations to the <<Intelligent function module parameter>> tab and <<FB support parameter>> tab

Delete	Deletes the initial setting and auto refresh setting of the selected module. However, if initial setting and auto refresh setting have been prepared and the cell of "initial setting" or "auto refresh" is selected and executed, only the setting of the selected cell is deleted.
Exit	Closes this screen.

When the <<FB support parameter>> tab is selected

<<Parameter	Moves the setting of the selected line to the <<Intelligent function module parameter>> tab.

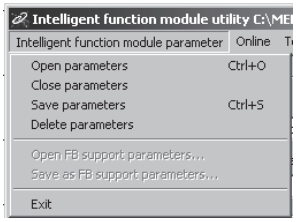
When the <<Intelligent Function Module Parameter>> tab is selected

FB parameter>>	Moves the setting of the selected line to the <<FB support parameter>> tab.

(3) Menu bar

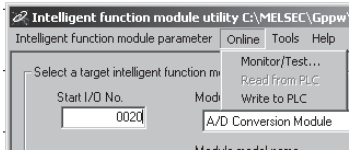
(a) File menu

Intelligent function module parameters of the project opened by GX Developer are handled.



[Open parameters]: Reads a parameter file.
[Close parameters]: Closes the parameter file. If any data are modified, a dialog asking for file saving will appear.
[Save parameters]: Saves the parameter file.
[Delete parameters]: Deletes the parameter file.
[Open FB support parameters]: Opens the FB support parameter file.
[Save as FB support parameters]: Saves the FB support parameter file.
[Exit]: Closes this screen.

(b) Online menu



[Monitor/Test]: Activates the Select monitor/test module screen.
[Read from PLC]: Reads intelligent function module parameters from the CPU module.
[Write to PLC]: Writes intelligent function module parameters to the CPU module.

POINT

(1) Saving intelligent function module parameters in a file
Since intelligent function module parameters cannot be saved in a file by the project saving operation of GX Developer, save them on the shown module selection screen.

(2) Reading/writing intelligent function module parameters from/to a programmable controller CPU using GX Developer
(a) Intelligent function module parameters can be read from and written into a programmable controller after having been saved in a file.
(b) Set a target programmable controller CPU in GX Developer: [Online] → [Transfer setup].

(3) Checking the required utility
While the start I/O is displayed on the Intelligent function module utility setting screen, "∗" may be displayed for the model name.
This means that the required utility has not been installed or the utility cannot be started from GX Developer.
Check the required utility, selecting [Tools] - [Intelligent function utility] - [Utility list...] in GX Developer.

5.4 Initial Setting

[Purpose]

The following A/D initial setting parameters are set:

- A/D conversion enable/disable setting
- Averaging process setting
- Time/number of times specifying
- Average time/average number of times setting

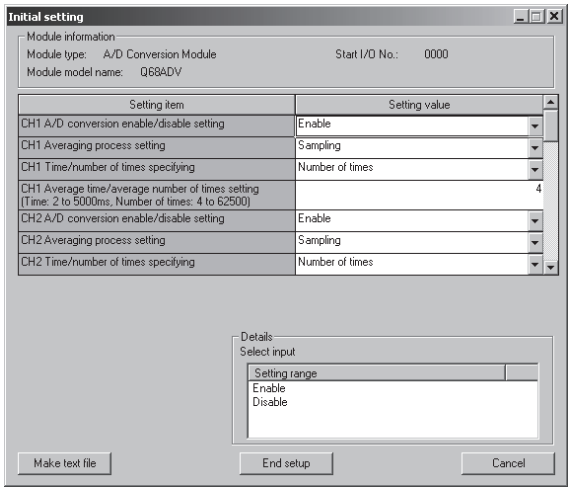
Setting parameters in the Initial setting screen will not required parameter settings with sequence program.

[Operating procedure]

"Start I/O No. *1" → "Module type" → "Module model name" → Initial setting

*1: Enter the start I/O No. in hexadecimal.

[Setting screen]



[Explanation of items]

(1) Setting contents

Set whether A/D conversion is enabled or disabled and the A/D conversion method for each channel.

(2) Command buttons

Make text file	Creates a file containing the screen data in text file format.
End setup	Saves the setting data and ends the operation.
Cancel	Cancels the setting and ends the operation.

POINT

Initial settings are stored in the intelligent function module parameter. After being written to the CPU module, the initial setting is made effective by either (1) or (2).

(1) Cycle the RUN/STOP switch of the CPU module: STOP → RUN → STOP → RUN.

(2) With the RUN/STOP switch set to RUN, turn off and then on the power or reset the CPU module.

When using a sequence program, the initial setting parameters are written at the time the CPU module status changes from STOP to RUN. So, create the sequence program so that the initial setting will be reexecuted.

5.5 Auto Refresh Settings

[Purpose]

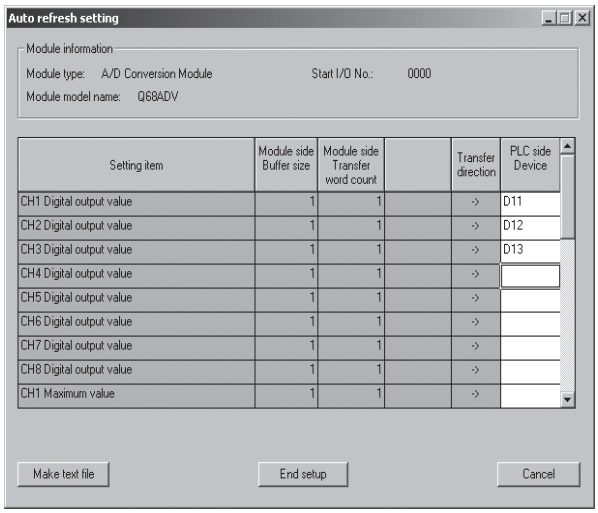
Configure the A/D converter module's buffer memory for auto refresh.

[Operating procedure]

"Start I/O No.*1" → "Module type" → "Module model name" → Auto refresh

*1: Enter the start I/O No. in hexadecimal.

[Setting screen]



[Explanation of items]

(1) Items

Model side Buffer size : Displays the size of the buffer memory for the setting item that can be transferred (fixed at one word).

Model side Transfer word count : Displays the number of words to transfer the CPU device from the head device (fixed at one word).

Transfer direction : "←" indicates that data is written from the device to the buffer memory.
"→" indicates that data is read from the buffer memory to the device.

PLC side Device : Enter a CPU module side device that is to be automatically refreshed.
Applicable devices are X, Y, M, L, B, T, C, ST, D, W, R, and ZR.
When using bit devices X, Y, M, L or B, set a number that can be divided by 16 points (examples: X10, Y120, M16, etc.)
Also, buffer memory data are stored in a 16-point area, starting from the specified device number. For example, if X10 is entered, data are stored in X10 to X1F.

(2) Command buttons

Make text file	Creates a file containing the screen data in text file format.
End setup	Saves the setting data and ends the operation.
Cancel	Cancels the setting and ends the operation.

POINT

The auto refresh settings are stored in an intelligent function module parameter file.

After being written to the CPU module, the auto refresh setting takes effect by either (1) or (2).

(1) Turn the RUN/STOP switch of the CPU module: STOP → RUN → STOP → RUN.

(2) After the RUN/STOP switch is set to RUN, turn off and then on the power or reset the CPU module.

The auto refresh settings cannot be changed from sequence programs. However, processing equivalent to auto refresh can be added using the FROM/TO instruction in the sequence program.

5.6 Monitoring /Test

5.6.1 Monitor/test screen

[Purpose]

Buffer memory monitoring/testing, I/O signals monitoring/testing, operating condition setting, offset/gain settings (refer to Section 5.6.2, 5.6.3), pass data (refer to Section 5.6.5, 5.6.6) are started from this screen.

[Operating procedure]

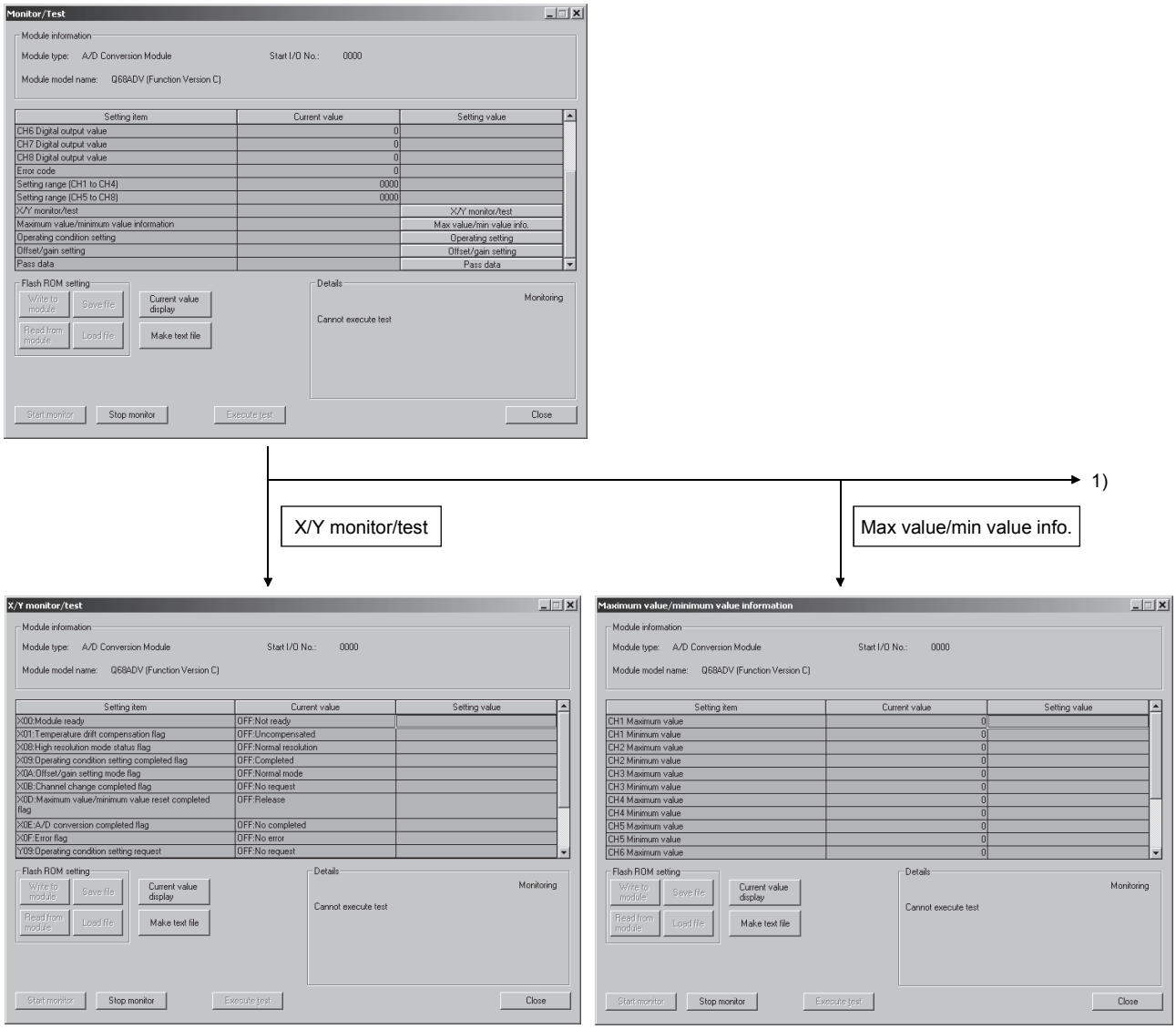
"Select monitor/test module" screen → "Start I/O No. ∗1" → "Module type" → "Module model name" → Monitor/test

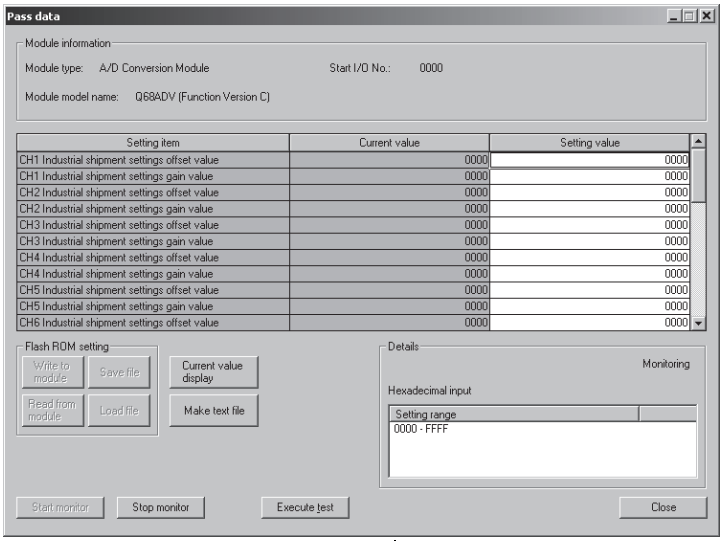
∗1: Enter the start I/O No. in hexadecimal.

The screen can also be started from System monitor of GX Developer Version 6 or later.

Refer to the GX Developer Operating Manual for details.

[Setting screen]



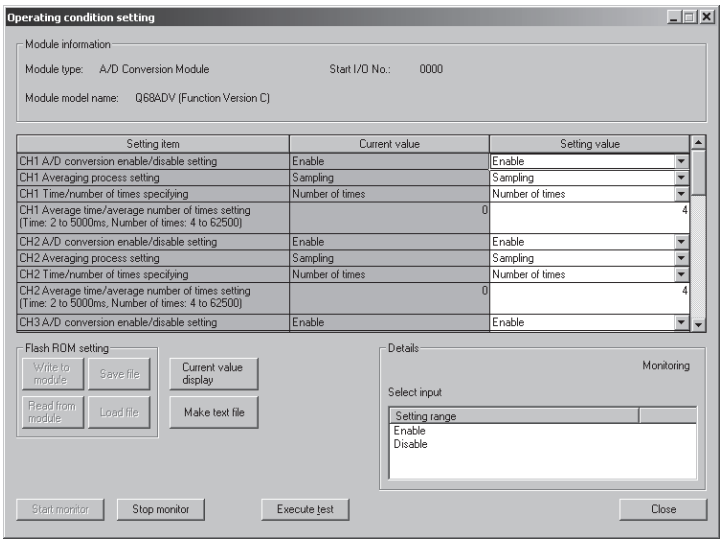


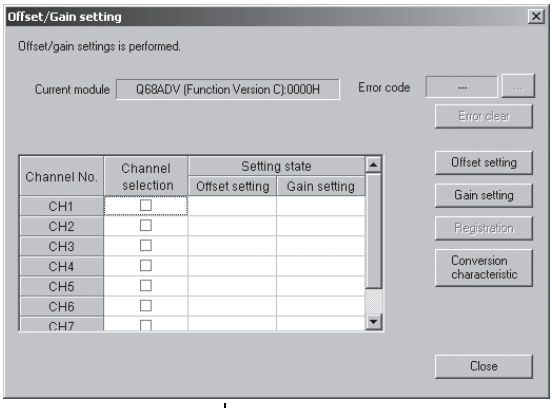
Pass data

1)

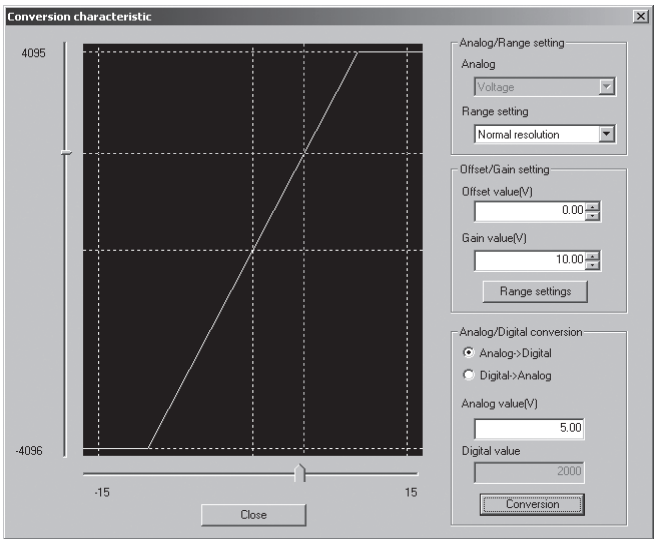
Operating setting

Offset/gain setting





Conversion characteristic



[Explanation of items]

(1) Items

Setting item : Displays I/O signals and buffer memory names.
Current value : Monitors the I/O signal states and present buffer memory values.
Setting value : Select or enter the data to be written during test operation.

(2) Command buttons

Current value display	Displays the current value of the item selected. (This is used to check the text that cannot be displayed in the current value field. However, in this utility package, all items can be displayed in the display fields).
Make text file	Creates a file containing the screen data in text file format.
Start monitor / Stop monitor	Selects whether or not to monitor current values.
Execute test	Performs a test on the selected items. To select more than one item, select them while holding down the Ctrl key.
Close	Closes the screen that is currently open and returns to the previous screen.

(3) Operation examples of "Execute test"

The following explains changing CH1 A/D conversion method, from the sampling processing to Averaging process setting of every ten conversions, and enables the settings.

(a) Click the Operating condition setting button on the Monitor/Test screen.

(b) Change the "setting value" field for "CH1 Averaging process setting" to "Averaging".

(c) Change the "setting value" field for "CH1 Time/number of times specifying" to "Number of times".

(d) Click the "setting value" field for "CH1 Time/number of times specifying".

(e) Input "10" as the average number of processing times and press the Enter key.

At this point, the setting data have not been written to the A/D converter module.

(f) Select the "Setting value" fields input in the operations (b) to (e) while pressing the Ctrl key. Multiple fields can be selected by dragging the mouse over them.

(g) Click the Execute test button to write the data.

After the completion of writing, the written values are displayed in the "Current value" field.

At this time, the operation is the same as before changing the setting value in (b), (c), (d), and (e).

(h) Set the "Setting value" field of "Operating condition setting request" to "Setting request".

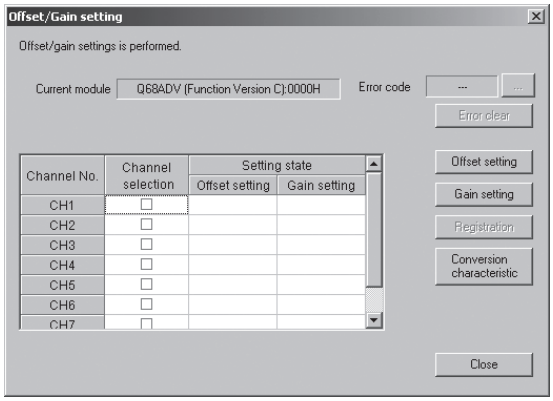
(i) Click the Execute test button while the "Setting value" field of "Operating condition setting request" is selected to validate the setting.

5.6.2 Offset/gain setting operation (Function version C or later)

Perform the offset/gain setting operation in the following sequence.

(1) Switch to the offset/gain setting screen

Perform the operation in Section 5.6.1 to display the offset/gain setting screen. At this point, a dialog box to confirm the transition of module's operation mode (normal mode -> offset/gain setting mode) is displayed. Click the Yes button to transit to the offset/gain setting mode.



(2) Specify channels

Place check marks in "Channel selection" column to specify the channels for each of which the offset or gain setting is to be made.

(3) Apply current/voltage

Apply current or voltage to the module.

(4) Execute offset/gain setting

For each of the channels specified in (2), click the Offset setting or Gain setting button to execute respective setting.

(5) Write settings into the module

Write the content set by operations (2) to (4) into the module by clicking the Registration button.

(a) Precautions

Do not perform the following operations during writing the content set by clicking the Registration button into the module. If performed, an error occurs in E^2PROM data and the A/D converter module may not operate properly.

- Powering off the programmable controller CPU.
- Resetting the programmable controller CPU.

(6) Switch to the normal mode

When the offset/gain setting screen is closed by clicking the [Close] button after the setting operation has finished, module's operation mode transits to the normal mode.

POINT

If an error code is displayed while performing the setting operation, the details and measure of the error can be confirmed by clicking the [...] button to the right of the error code display area. In addition, the error code can be cleared by clicking the [Error clear] button.

5.6.3 Offset/gain setting operation (Function version B or earlier)

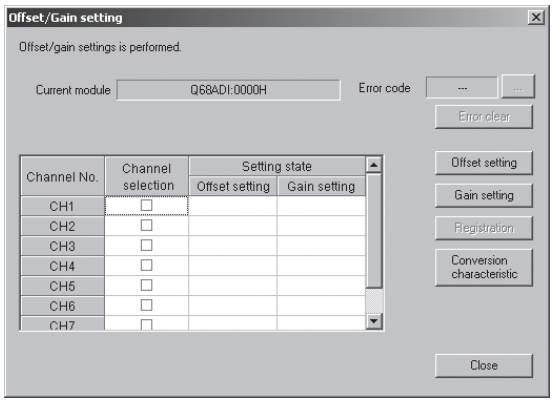
Perform the offset/gain setting operation in the following sequence.

(1) Switch to the offset/gain setting mode

Change switch 4 for intelligent function module switch setting to the offset/gain setting mode (refer to Section 4.5).

(2) Switch to the offset/gain setting screen

Display the offset/gain setting screen using the operation described in Section 5.6.1.



(3) Specify channels

Place check marks in "Channel selection" column to specify the channels for each of which the offset or gain setting is to be made.

(4) Apply current/voltage

Apply current or voltage to the module.

(5) Execute offset/gain setting

For each of the channels specified in (3), click the Offset setting or Gain setting button to execute respective setting.

(6) Write settings into the module

Write the content set by operations (2) to (4) into the module by clicking the Registration button.

(a) Precautions

Do not perform the following operations during writing the content set by clicking the Registration button into the module. If performed, an error occurs in E^2PROM data and the A/D converter module may not operate properly.

- Powering off the programmable controller CPU.
- Resetting the programmable controller CPU.

(7) Switch to the normal mode

After the setting has finished, click the Close button to close the offset/gain setting screen, and set Switch 4 of the intelligent function module switch settings to the normal mode. (Refer to Section 4.5.)

POINT

If an error code is displayed while performing the setting operation, the details and measure of the error can be confirmed by clicking the ... button to the right of the error code display area. In addition, the error code can be cleared by clicking the Error clear button.

5.6.4 Confirmation of Conversion Characteristic

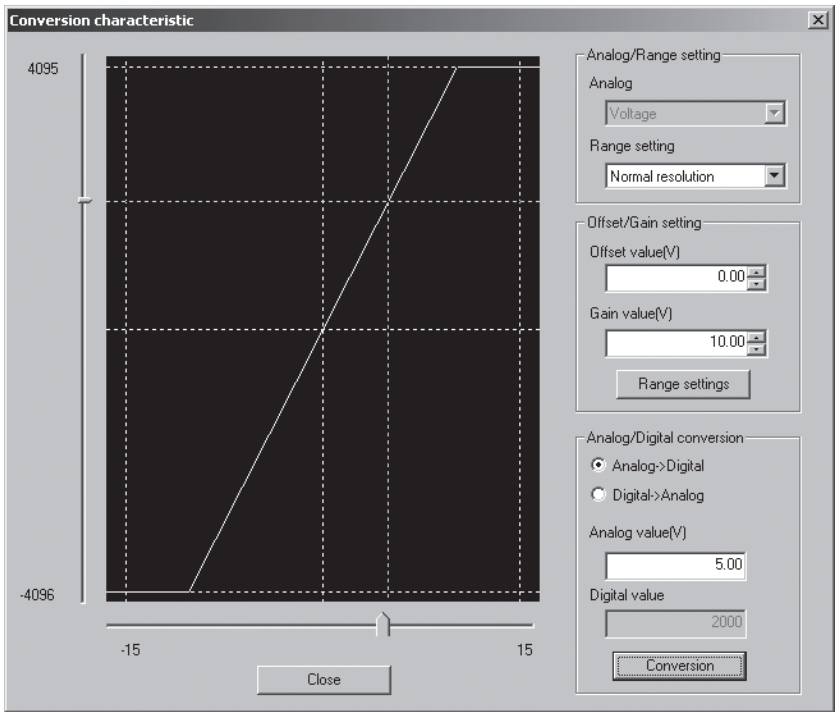
[Purpose]

The converted value of digital-analog conversion can be confirmed according to the tilt of the graph, based on the offset/gain setting.

[Operating procedure]

Monitor/test screen → Offset/gain setting → Conversion characteristic

[Setting screen]



[Explanation of items]

(1) Items displayed on the screen

I/O characteristic diagram: Displays the I/O conversion characteristic to the prepared offset/gain setting.

(2) Setting details

Analog/Range setting

Analog:	Select the type of the analog signal input (voltage or current).
Range setting:	Make selection from "Normal resolution" or "High resolution". For digital input values and maximum resolution of the normal resolution mode and high resolution mode, refer to the POINT(2) in this section.

Offset/Gain setting

Offset value:	Enter an offset value to display the I/O characteristic diagram.
Gain value:	Enter a gain value to display the I/O characteristic diagram.

Analog/Digital conversion: Select a conversion type shown below for confirming the correspondence between an analog value and a digital value caused by the conversion characteristic.
- Digital → Analog
- Analog → Digital

Analog value: <When converted to a digital value>
Enter an analog value to be converted to a digital value
<When converted to an analog value>
The analog value converted from a digital value is displayed.

Digital value: <When converted to a digital value>
The digital value corresponding to an entered analog value is displayed.
<When converted to an analog value>
Enter a digital value to be converted to an analog value.

POINT

(1) The following explains offset value and gain value.
- An offset value refers to the analog input value (voltage or current) whose Digital output value be 0.
- A gain value refers to the analog input value (voltage or current) whose Digital output value is:
  4000 (in normal resolution mode)
  12000 (in high resolution mode)

(2) Set the "offset value" and "gain values" within a range in which the following conditions are met.

(a) When selecting "Voltage" in the "Analog/Range setting".
1) Setting ranges of the offset value and the gain value: -10.0 to 10.0V
2) Normal resolution mode: { (Gain value) - (Offset value) } > 1.5V
High resolution mode: { (Gain value) - (Offset value) } ≥ 4.0V
3) { (Gain value) - (Offset value) } ≤ 10.0V

(b) When selecting "Current" in the "Analog/Range setting".
1) Setting ranges of the offset value and the gain value: -20.0 to 20.0mA
2) Normal resolution mode: { (Gain value) - (Offset value) } > 5.5mA
High resolution mode: { (Gain value) - (Offset value) } ≥ 16.0mA

(3) Explanation of screen command buttons

Range setting — The entered offset/gain value is determined, and the I/O characteristic diagram is updated.

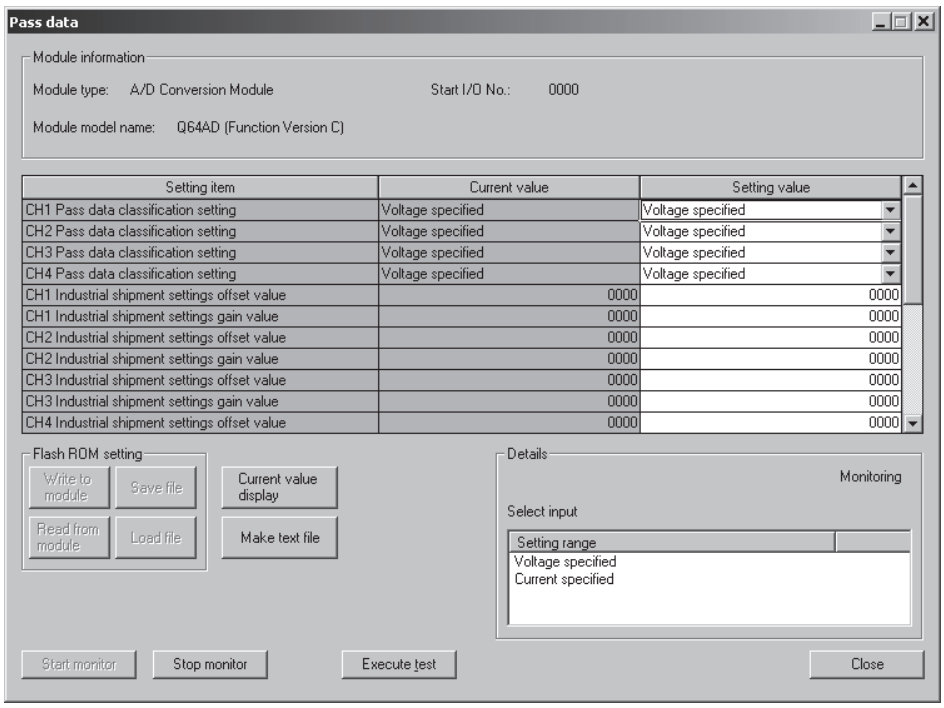
Conversion — Conversion for the entered value is performed.

5.6.5 Pass data (Q64AD)

Perform operation in the following sequence to save/restore the user range.

(1) Switch to the pass data screen

Perform the operation in Section 5.6.1 to display the Pass data screen.



(2) User range saving

(a) Set "Voltage specified" or "Current specified" in the Setting value field of Pass data classification setting, and click the Execute test button.

When the setting is completed, the setting data is displayed in the Current value field of CH☐ Pass data classification setting.

(b) Change the Setting value field of Pass data read request to "Request", and click the Execute test button.

When read is completed, the values are displayed in the Current value fields of CH☐ Industrial shipment settings offset/gain values/CH☐ User range settings offset/gain values.

(c) Compare the values with those in the range reference table, and record them if they are correct.
Refer to Section 7.4 for the range reference table.

(3) User range restoration

(a) Set "Voltage specified" or "Current specified" in the Setting value field of Pass data classification setting, and click the Execute test button.

When the setting is completed, the setting data is displayed in the Current value field of CH☐ Pass data classification setting.

(b) Set the recorded values in the Setting value fields of CH☐ Industrial shipment settings offset/gain values/user range settings offset/gain values.

(c) Select all the Setting value fields of CH☐ Industrial shipment settings offset/gain values/user range settings offset/gain values, and click the Execute test button.

When write is completed, the set values are displayed in the Current value fields of CH☐ Industrial shipment settings offset/gain values/CH☐ User range settings offset/gain values.

(d) Change the Setting value field of Pass data write request to "Request", and click the Execute test button.

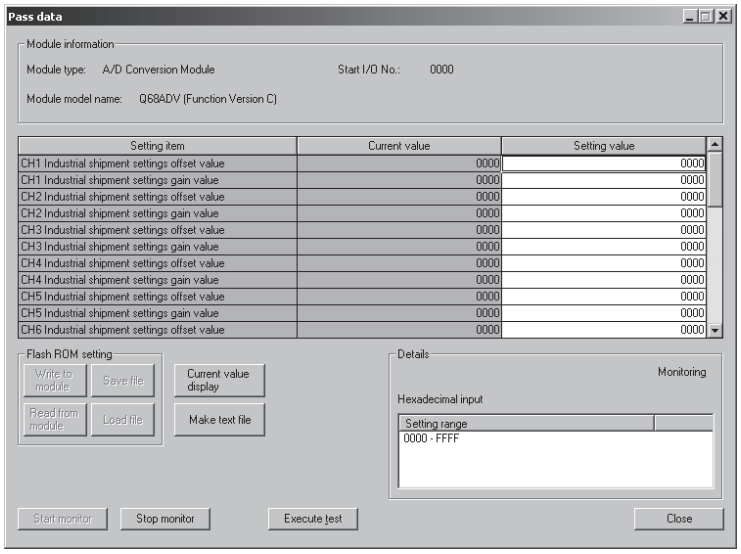
Make sure that the indication in the Current value field of Pass data write request changes from "Request" to "OFF" on completion of write.

5.6.6 Pass data (Q68ADV/Q68ADI)

Perform operation in the following sequence to save/restore the user range.

(1) Switch to the pass data screen

Perform the operation in Section 5.6.1 to display the pass data screen.



(2) User range saving

(a) Change the Setting value field of pass data read request to "Request", and click the Execute test button.

When read is completed, the values are displayed in the Current value fields of CH☐ industrial shipment settings offset/gain values/CH☐ user range settings offset/gain values.

(b) Compare the values with those in the range reference table, and record them if they are correct.
Refer to Section 7.4 for the range reference table.

(3) User range restoration

(a) Set the recorded values in the Setting value fields of CH☐ industrial shipment settings offset/gain values/user range settings offset/gain values.

(b) Select all the Setting value fields of CH☐ industrial shipment settings offset/gain values/user range settings offset/gain values, and click the Execute test button.

When write is completed, the set values are displayed in the Current value fields of CH☐ industrial shipment settings offset/gain values/ CH☐ user range settings offset/gain values.

(c) Change the Setting value field of pass data write request to "Request", and click the Execute test button.

Make sure that the indication in the Current value field of pass data write request changes from "Request" to "OFF" on completion of write.

5.7 FB Conversion of Initial Setting/Auto Refresh Setting

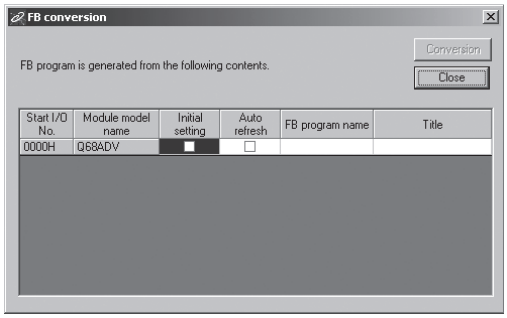
[Purpose]

FB is generated automatically from the intelligent function module parameter (initial setting/auto refresh setting).

[Operating procedure]

Intelligent Function Module Parameter Setting Module Selection Screen → <<FB Support Parameter>> tab → FB conversion

[Setting screen]



[Explanation of items]

(1) Items displayed on the screen

Start I/O No.:
The start I/O No. of the information which is set up on the currently open intelligent function module parameter is displayed.

Module model name:
The module model name of the information which is set up on the currently open intelligent function module parameter is displayed.

Initial setting:
Set up whether to apply FB conversion to the parameter or not.
Check if you apply FB conversion to the parameter.

Auto refresh:
Set up whether to apply FB conversion to the parameter or not.
Check if you apply FB conversion to the parameter.

FB program name:
Set up the name of the converted FB program.
Up to six single-byte characters can be set up as an FB program name.
However, the characters and terms shown below cannot be set up as FB program name.
Character: \, /, :, ;, *, ?, ", <, >, |, ,",,,.,
Term: COM1 to COM9, LPT1 to LPT9, AUX, PRN, CON, NUL, CLOCK$
In addition, I- is added for initial setting and A- is added for auto refresh setting respectively to the top of the FB name setting to be registered in GX Developer after FB conversion is performed.
Ex.: If the FB program name is "ABCDE, " the initial setting is "I-ABCDE" and the auto refresh setting is "A-ABCDE. "

Title: Set up a title on a converted FB program. Up to 32 single-byte characters can be set up as a title.

(2) Explanation of screen command buttons

Conversion — FB conversion is performed for the checked columns of initial setting and auto refresh setting.

5.8 Usage of FB

This section describes the procedure for using FB with GX Developer.
For details, refer to "GX Developer Version 8 Operating Manual (Function Block). "

5.8.1 Outline

The procedure for creating FB is shown below.

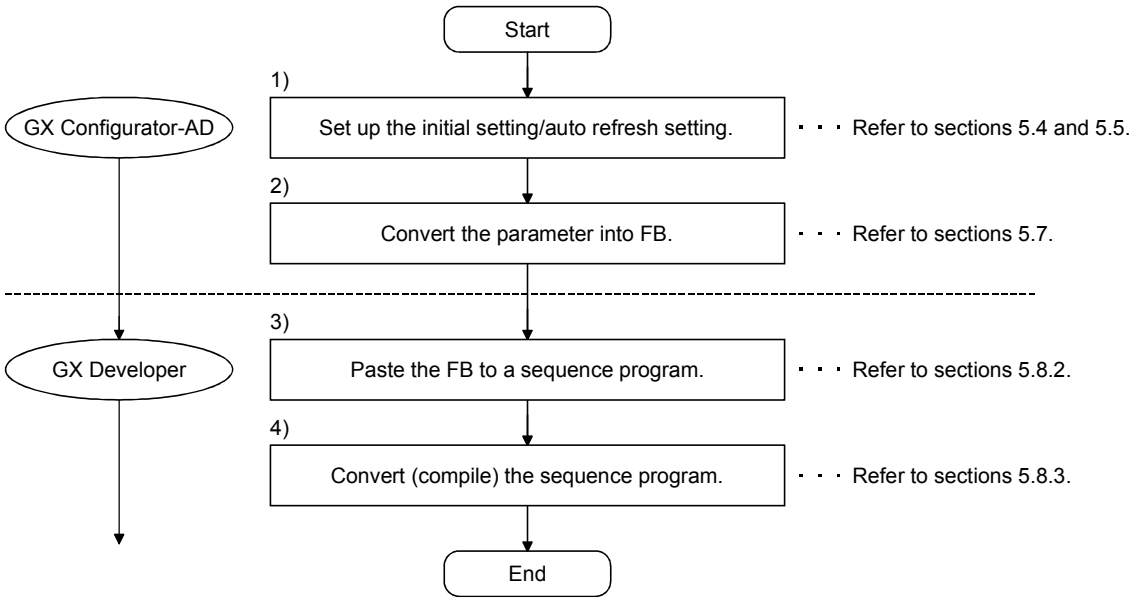
(1) Set up the intelligent function module parameter (initial setting/auto refresh setting).

(2) Convert the intelligent function module parameter into FB.

(3) Paste the FB to a sequence program.

(4) Convert (compile) the sequence program.

Next, a flowchart of procedures (1) to (4) is shown below.



POINT

The initial setting/auto refresh setting of the intelligent function module can be performed by each of the following methods.

(1) Set intelligent function parameters (Initial setting/Auto refresh setting) and write them to the programmable controller CPU.

(2) Create an FB of the intelligent function module parameter (initial setting/auto refresh setting) and paste it to the sequence program.

In accordance with the specification of the system, perform the initial setting/auto refresh setting of the intelligent function module by one of the methods above. *1

*1: The following explains the case in which both of (1) and (2) are performed.

(a) Initial setting
FB setting given in (2) is valid.

(b) Auto refresh setting
- Both (1) and (2) are valid.
- At the time of FB execution and in the END processing of the sequence program, auto refresh is performed.

5.8.2 Paste an FB to a Sequence Program

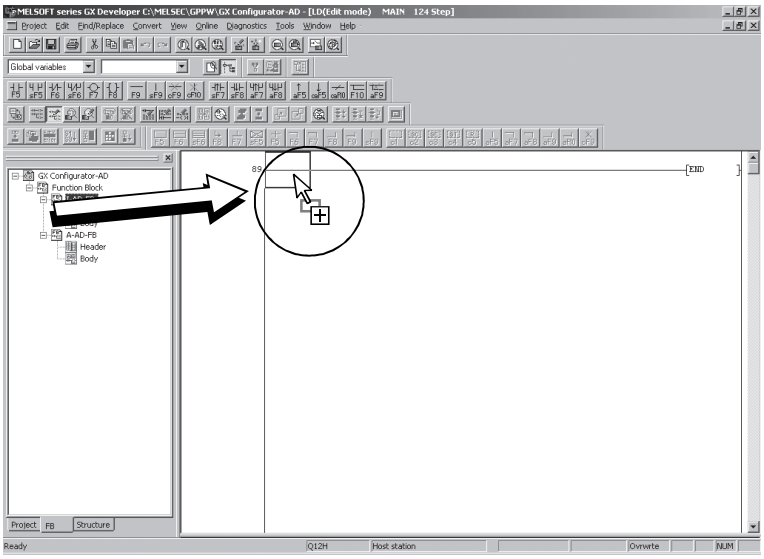
[Purpose of operation]

Paste an FB in order to use it with a sequence program.

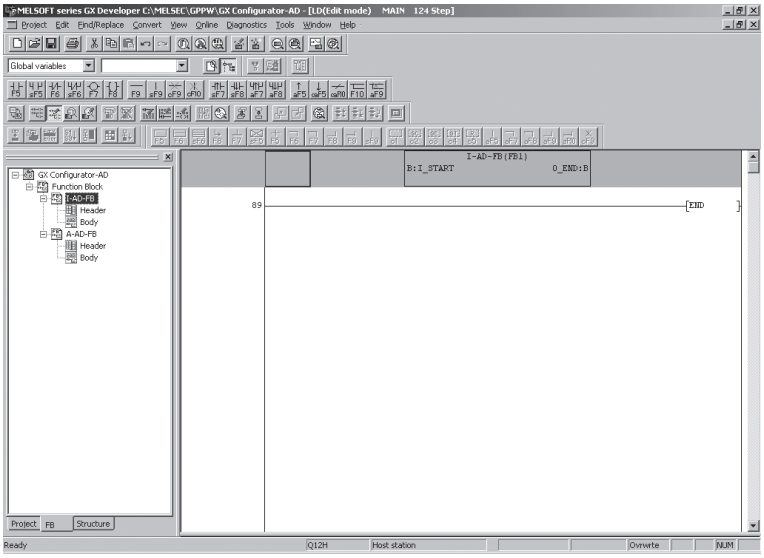
[Operation procedure]

Switch the <<Project>> tab into the <<FB>> tab on GX Developer, and drag & drop the FB to be used onto the sequence program.

Before pasting



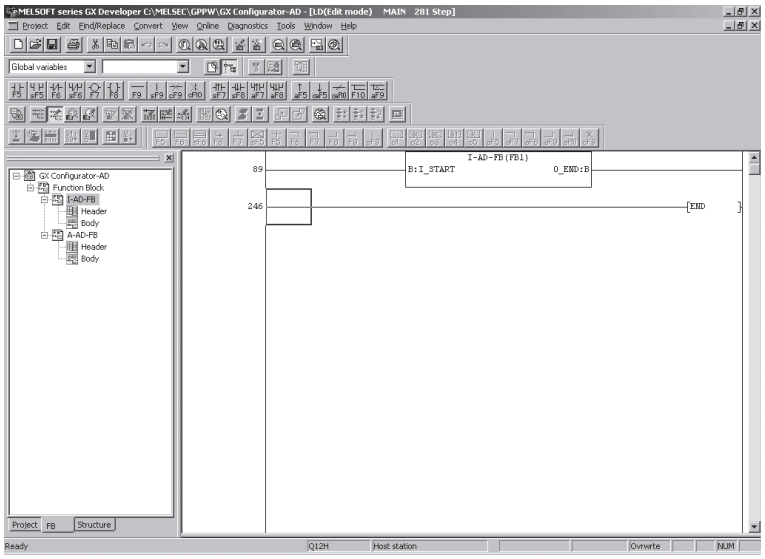
After pasting



5.8.3 Convert (Compile) a Sequence Program

[Purpose of operation]

Convert (compile) the sequence program to which an FB was pasted so that it can be executed.



[Operation procedure]

Click the [Convert] menu → [Convert/Compile] menu of GX Developer.

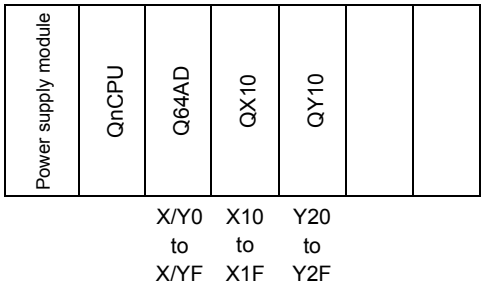
6 PROGRAMMING

This chapter describes the programs of the A/D converter module.
When applying any of the program examples introduced in this chapter to the actual system, verify the applicability and confirm that no problems will occur in the system control.

6.1 For Use in Normal System Configuration

System configuration used in the program explanation

(1) System configuration



Perform the following intelligent function module switch settings in advance.
- Switch 1 0430H (CH1: 4 to 20mA, CH2: 0 to 5V, CH3: -10 to 10V)
- Switch 2 Empty
- Switch 3 Empty
- Switch 4 0000H (Normal mode (A/D conversion processing))
- Switch 5 0000H (0: Fixed)

(2) Program conditions

This program reads the digital output values that have been A/D converted using CH 1 to CH3 of the Q64AD. CH1 performs sampling processing, CH2 performs averaging processing every 50 times, and CH3 performs averaging processing every 1000 ms. Error code appears in BCD format if a write error occurs.

(a) Contents of initial setting
- A/D conversion enable channel
  .....CH1 to CH3
- Channel performing averaging processing using number of times
  .....The average number of times set for CH2 is 50.
- Channel performing averaging processing using time
  .....The average time set for CH3 is 1000 ms

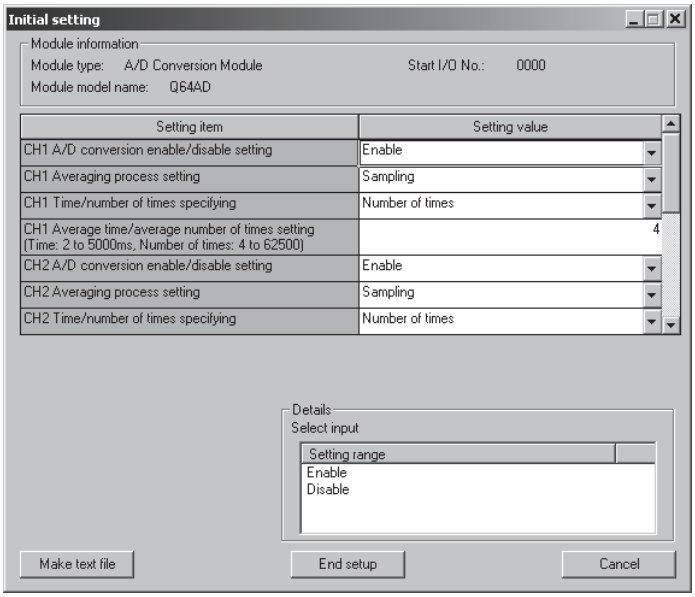
(b) Devices used by the user
- Error reset signal X10
- Input signal for Digital output value read command X11
- Error code display (3-digit BCD) ..... Y20 to Y2B
- CH1 Digital output value D11
- CH2 Digital output value D12
- CH3 Digital output value D13
- Error code D14

6.1.1 Programming example using the utility package

(1) Operating the utility package

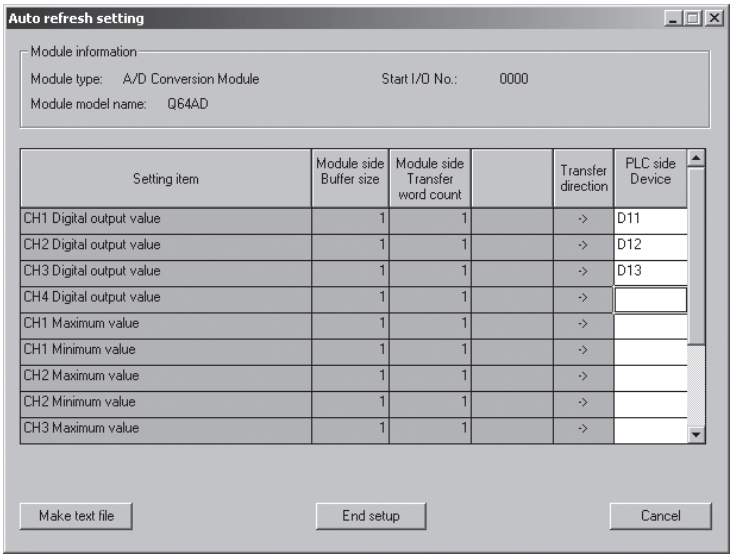
(a) Initial setting (refer to Section 5.4)

CH1, CH2, CH3 A/D conversion enable/disable setting ...."Enable"
CH1 Averaging process setting ....."Sampling"
CH2 Averaging process setting ....."Averaging"
CH2 Time/number of times specifying....."Number of times"
CH2 Average time/average number of times setting ....."50"
CH3 Averaging process setting ....." Averaging"
CH3 Time/number of times specifying....."Time (ms)"
CH3 Average time/average number of times setting ....."1000"



(b) Auto refresh setting (refer to Section 5.5)

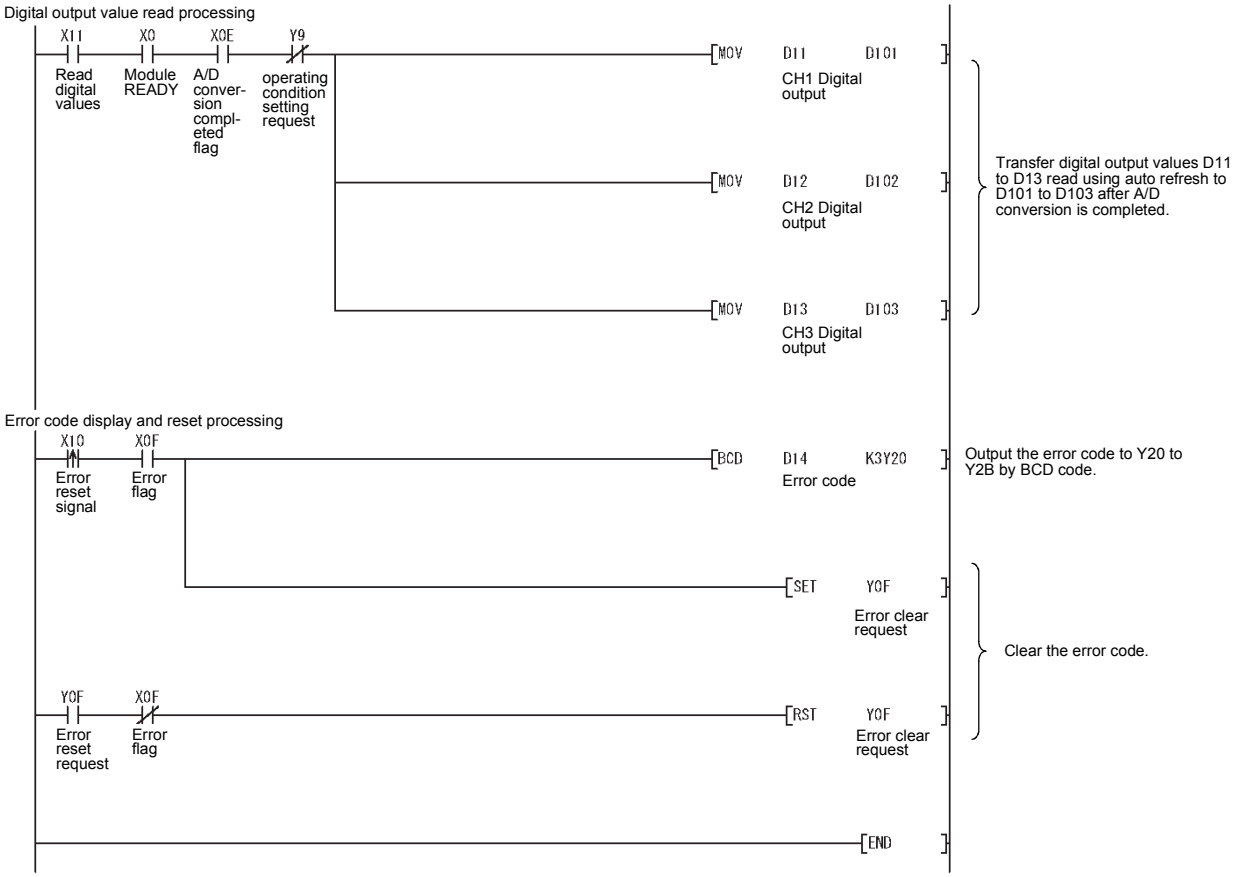
CH1 Digital output value....."D11"
CH2 Digital output value....."D12"
CH3 Digital output value....."D13"
Error code ....."D14"



(c) Writing the intelligent function module parameters (refer to Section 5.3.3)

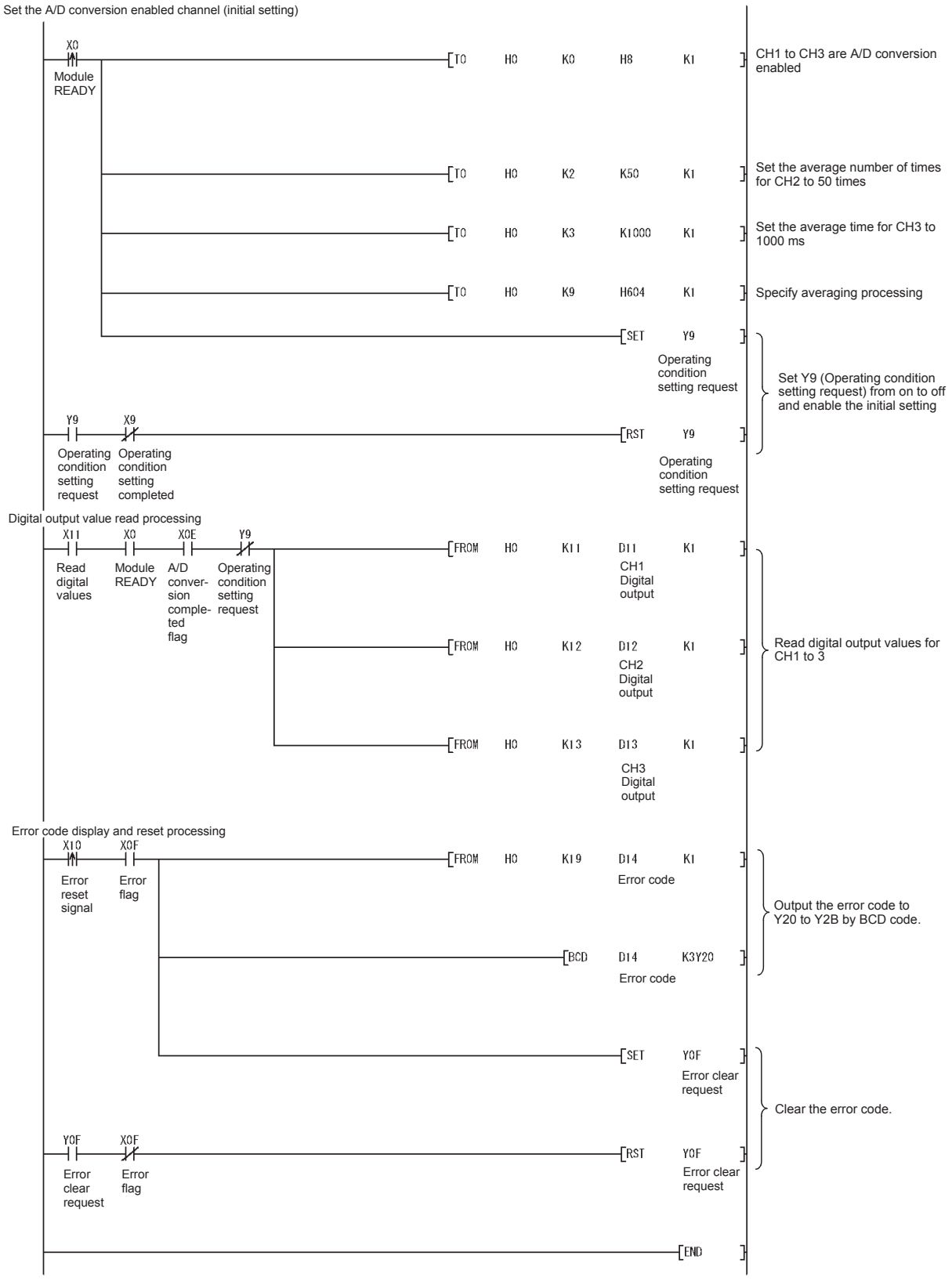
Write the intelligent function module parameters to the CPU module.
This operation is performed using the parameter setting module selection screen.

(2) Programming example

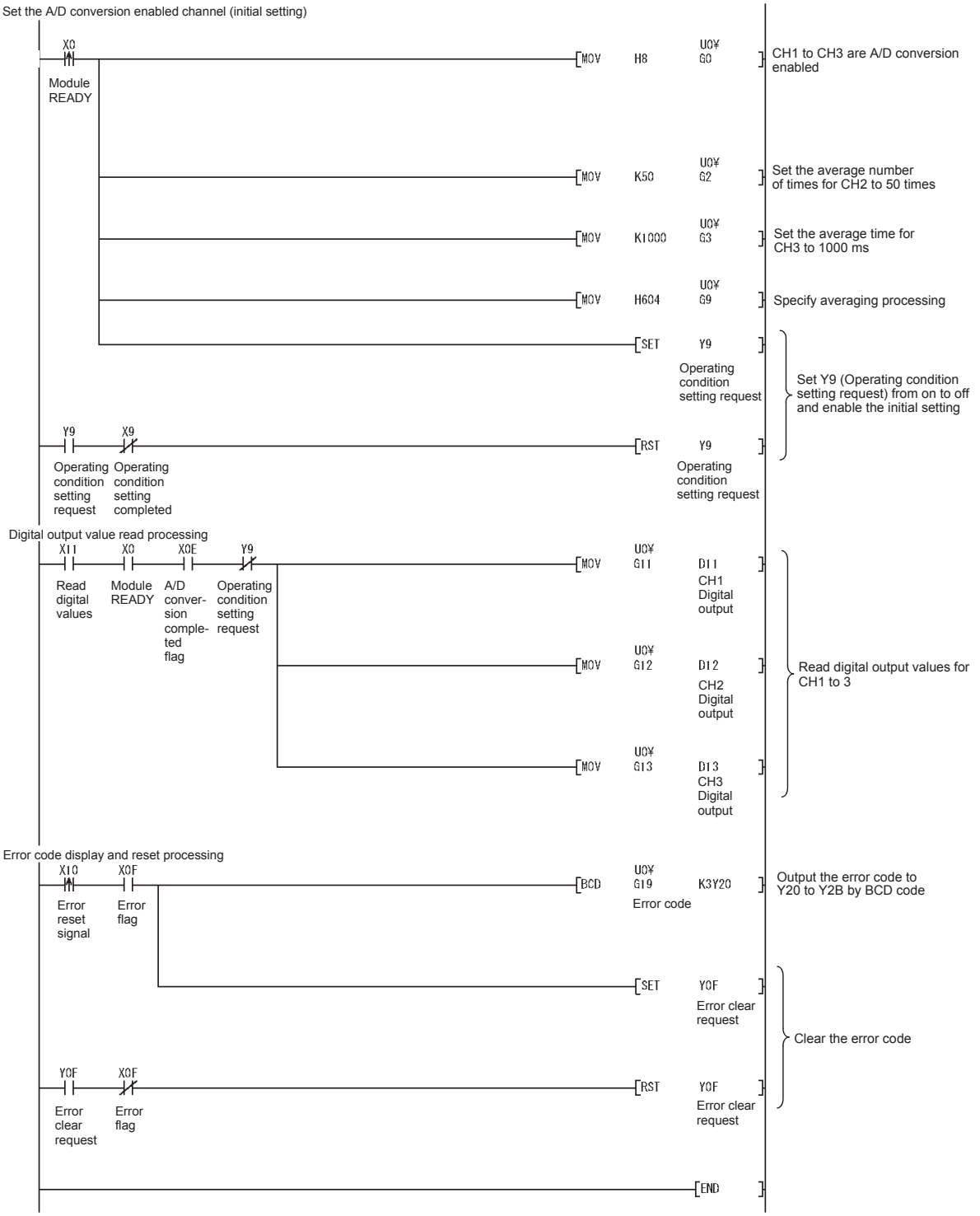


6.1.2 Programming example without using the utility package

(1) Programming example using the FROM/TO commands



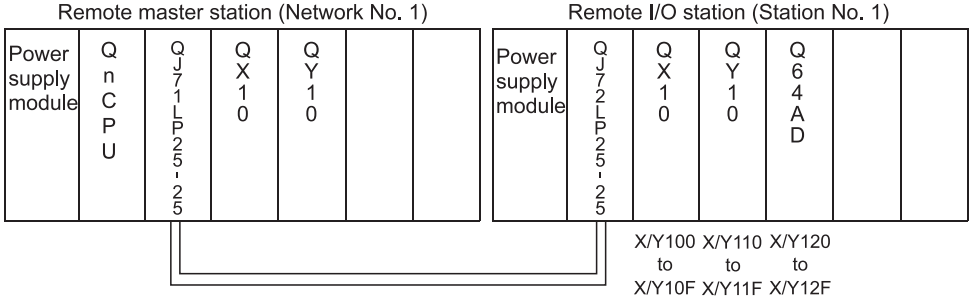
(2) Programming example using the intelligent function module device (U□\G□)



6.2 For Use in Remote I/O Network

System configuration used in the program explanation

(1) System configuration



Perform the following intelligent function module switch settings in advance.

- Switch 1 0430H (CH1: 4 to 20mA, CH2: 0 to 5V, CH3: -10 to 10V)
- Switch 2 Empty
- Switch 3 Empty
- Switch 4 0000H (Normal mode (A/D conversion processing))
- Switch 5 0000H (0: Fixed)

(2) Program conditions

In this program, the digital output values that have been A/D converted using CH1 to CH3 of the Q64AD are read by the CPU of the remote master station. CH1 performs sampling processing, CH2 performs averaging processing every 50 times, and CH3 performs averaging processing every 1000ms. Error code appears in BCD format if a write error occurs.

(a) Initial settings

- A/D conversion enable channel.....CH1 to CH3
- Count-based averaging processing channel .....Average count setting of CH2 : 50 times
- Channel performing averaging processing using time .....Average time setting of CH3 : 1000ms

(b) Devices used by the user

- Initial setting request signal X20
- Digital output value read command input signal.....X21
- Error reset signal.....X23
- Error code display (BCD 3 digits).....Y30 to Y3B
- CH1 Digital output value D11 (W11)
- CH2 Digital output value D12 (W12)
- CH3 Digital output value D13 (W13)
- Error code.....D14 (W14)

POINT

For details on the MELSECNET/H remote I/O network, refer to the Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network).

6.2.1 Programming example using the utility package

(1) Operating GX Developer

(a) CPU parameter setting

- Network type : MNET/H (Remote master)
- Starting I/O No. : 0000H
- Network No. : 1
- Total stations : 1
- Mode : Online
- Network range assignment :

StationNo.	M station -> R station						M station <- R station					
	Y			Y			X			X		
	Points	Start	End	Points	Start	End	Points	Start	End	Points	Start	End
1	256	0100	01FF	256	0000	00FF	256	0100	01FF	256	0000	00FF

StationNo.	M station -> R station			M station <- R station			M station -> R station			M station <- R station		
	B			B			W			W		
	Points	Start	End	Points	Start	End	Points	Start	End	Points	Start	End
1							160	0100	019F	160	0000	009F

- Refresh parameters :

Assignment method: (○) Points/Start (●) Start/End

Transient transmission error history status: (●) Overwrite (○) Hold

	Link side					PLC side			
	Dev. name	Points	Start	End		Dev. name	Points	Start	End
Transfer SB	SB	512	0000	01FF	⇔	SB	512	0000	01FF
Transfer SW	SW	512	0000	01FF	⇔	SW	512	0000	01FF
Random cyclic	LB				⇔				
Random cyclic	LW				⇔				
Transfer1	LB	8192	0000	1FFF	⇔	B	8192	0000	1FFF
Transfer2	LW	8192	0000	1FFF	⇔	W	8192	0000	1FFF
Transfer3	LX	512	0000	01FF	⇔	X	512	0000	01FF
Transfer4	LY	512	0000	01FF	⇔	Y	512	0000	01FF
Transfer5					⇔				
Transfer6					⇔				

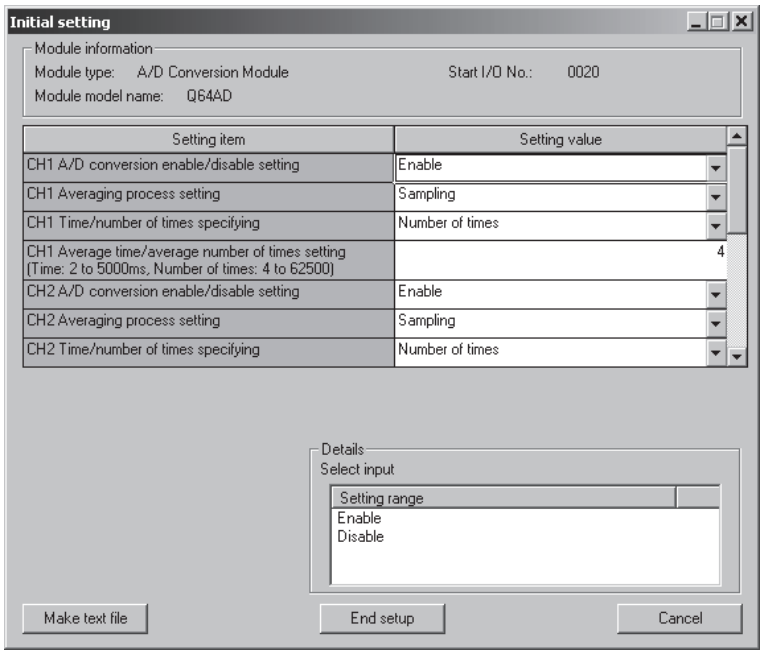
(2) Operating the utility package

Operate the utility package on the remote I/O station side.
Set the following in the Intelligent function module parameter setting module select area.

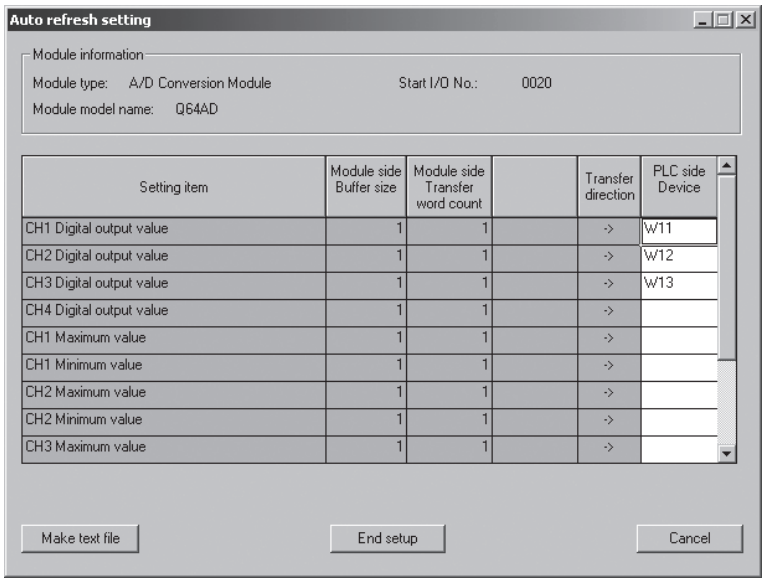
- Start I/O No. : 20
- Module type : A/D Conversion Module
- Module model name : Q64AD

(a) Initial setting (refer to Section 5.4)

CH1, CH2, CH3 A/D conversion enable/disable setting ....."Enable"
CH1 Averaging process setting ....."Sampling"
CH2 Averaging process setting ....."Averaging"
CH2 Time/number of times specifying....."Number of times"
CH2 Average time/average number of times setting ....."50"
CH3 Averaging process setting ....."Averaging"
CH3 Time/number of times specifying....."Time (ms)"
CH3 Average time/average number of times setting ....."1000"

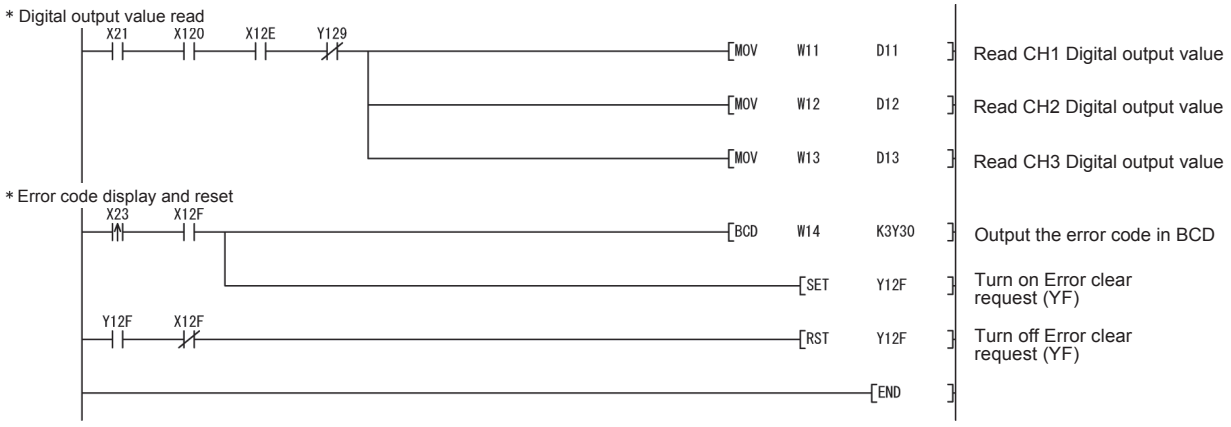


(b) Auto refresh setting (refer to Section 5.5)
CH1 Digital output value....."W11"
CH2 Digital output value....."W12"
CH3 Digital output value....."W13"
Error code ....."W14"


Auto refresh setting
Module information
Module type: A/D Conversion Module
Start I/O No.: 0020
Module model name: Q64AD
Setting item
Module side Buffer size
Module side Transfer word count
Transfer direction
PLC side Device
CH1 Digital output value 1 1 -> W11
CH2 Digital output value 1 1 -> W12
CH3 Digital output value 1 1 -> W13
CH4 Digital output value 1 1 ->
CH1 Maximum value 1 1 ->
CH1 Minimum value 1 1 ->
CH2 Maximum value 1 1 ->
CH2 Minimum value 1 1 ->
CH3 Maximum value 1 1 ->
Make text file
End setup
Cancel

(c) Writing the intelligent function module parameters (refer to Section 5.3.3)
The intelligent function module parameters are written to the remote I/O station.
This operation is performed using the Intelligent function module parameter setting module select screen.

(3) Programming example



POINT

To write the intelligent function module parameters, set the target remote I/O station from [Online] - [Transfer setup] on GX Developer.
They can be written by:
- Directly connecting GX Developer to the remote I/O station.
- Connecting GX Developer to another device such as a CPU module and passing through the network.

6.2.2 Programming example without using the utility package

POINT

The dedicated instructions used for reading/writing the buffer memory of the intelligent function module on a remote I/O station (REMTO and REMFR) are the execution type for which several scans are needed. Therefore, transmissions of the execution results are not synchronized with the I/O signal operations. When reading a digital output value on an A/D converter module after changing the operating condition during operation, be sure to read A/D conversion completed flag (buffer memory address 10) at the same time.
Also, for the case of changing the operating condition, insert an interlock to prevent the execution of the REMFR instruction.

(1) Operating GX Developer (CPU parameter setting)

- Network type : MNET/H (Remote master)
- Starting I/O No. : 0000H
- Network No. : 1
- Total stations : 1
- Mode : Online
- Network range assignment :

StationNo.	M station -> R station						M station <- R station					
	Y			Y			X			X		
	Points	Start	End	Points	Start	End	Points	Start	End	Points	Start	End
1	256	0100	01FF	256	0000	00FF	256	0100	01FF	256	0000	00FF

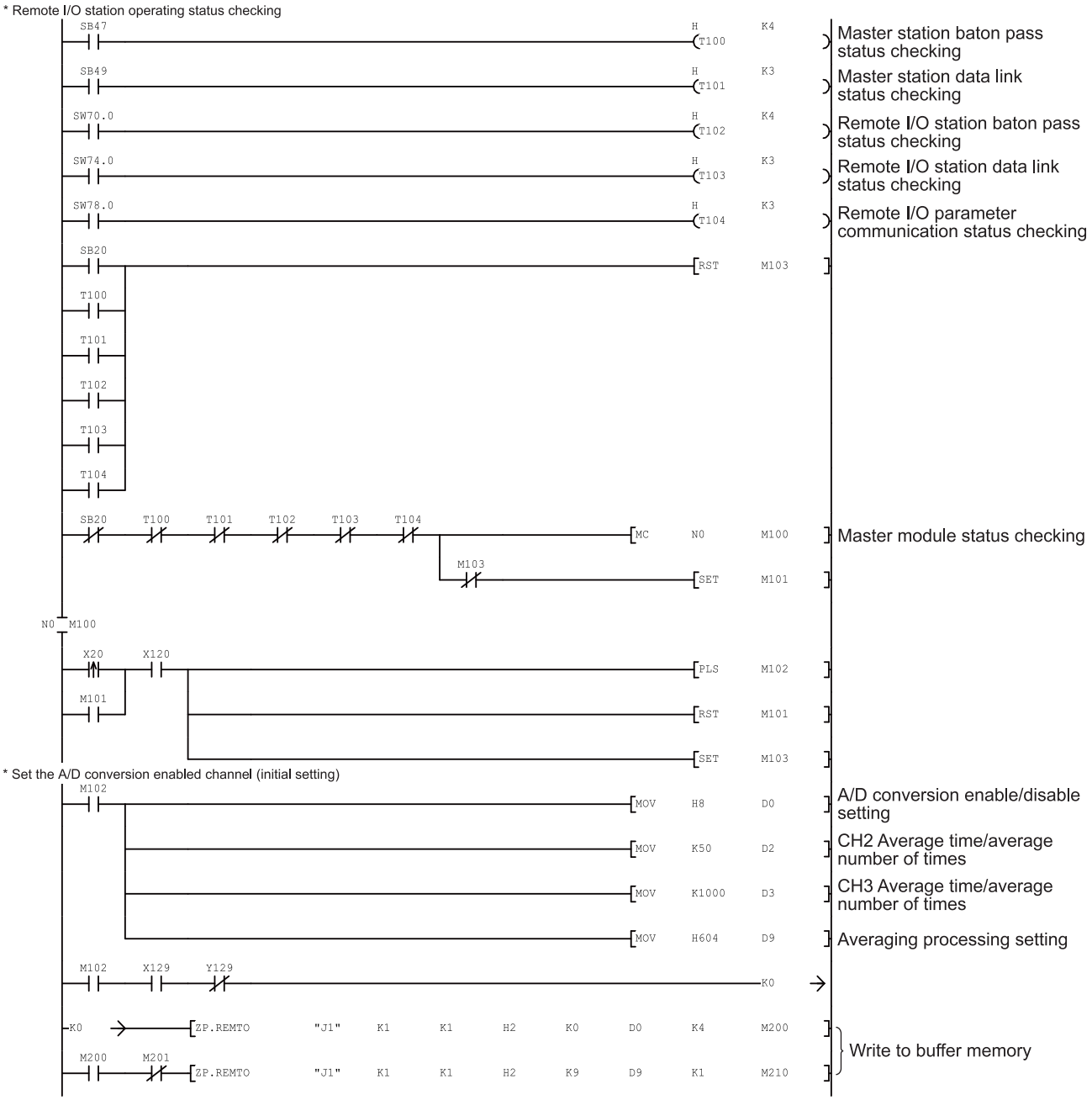
- Refresh parameters :

Assignment method: (○) Points/Start (●) Start/End

Transient transmission error history status: (●) Overwrite (○) Hold

	Link side					PLC side			
	Dev. name	Points	Start	End		Dev. name	Points	Start	End
Transfer SB	SB	512	0000	01FF	⇔	SB	512	0000	01FF
Transfer SW	SW	512	0000	01FF	⇔	SW	512	0000	01FF
Random cyclic	LB				⇔				
Random cyclic	LW				⇔				
Transfer1	LB	8192	0000	1FFF	⇔	B	8192	0000	1FFF
Transfer2	LW	8192	0000	1FFF	⇔	W	8192	0000	1FFF
Transfer3	LX	512	0000	01FF	⇔	X	512	0000	01FF
Transfer4	LY	512	0000	01FF	⇔	Y	512	0000	01FF
Transfer5					⇔				
Transfer6					⇔				

(2) Programming example



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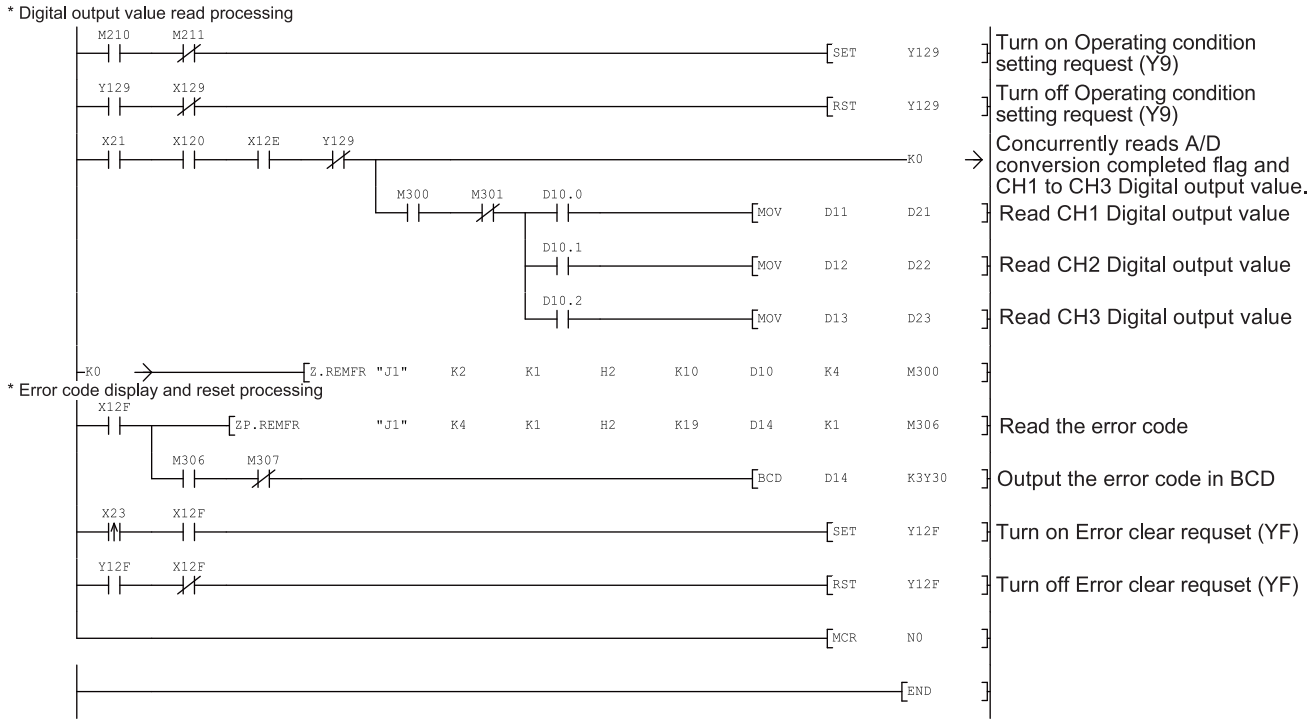
* Digital output value read processing
M210
M211
SET Y129
Turn on Operating condition setting request (Y9)
Y129
X129
RST Y129
Turn off Operating condition setting request (Y9)
X21
X120
X12E
Y129
K0
Concurrently reads A/D conversion completed flag and CH1 to CH3 Digital output value.
M300
M301
D10.0
MOV D11 D21
Read CH1 Digital output value
D10.1
MOV D12 D22
Read CH2 Digital output value
D10.2
MOV D13 D23
Read CH3 Digital output value
K0
Z.REMFR "J1" K2 K1 H2 K10 D10 K4 M300
* Error code display and reset processing
X12F
ZP.REMFR "J1" K4 K1 H2 K19 D14 K1 M306
Read the error code
M306
M307
BCD D14 K3Y30
Output the error code in BCD
X23
X12F
SET Y12F
Turn on Error clear requset (YF)
Y12F
X12F
RST Y12F
Turn off Error clear requset (YF)
MCR N0
END

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7 ONLINE MODULE CHANGE

When performing an online module change, carefully read the following.
• QCPU User's Manual (Hardware Design, Maintenance and Inspection)
This chapter describes the specifications of an online module change.
(1) Perform an online module change by operating GX Developer.

(2) To ensure ease of offset/gain re-setting, there is a user range save/restoration function that is performed by executing the dedicated instruction or read/write from/to buffer memory.

POINT

(1) Perform an online module change after making sure that the system outside the programmable controller will not malfunction.
(2) To prevent an electric shock and malfunction of operating modules, provide means such as switches for powering off each of the external power supply and external devices connected to the module to be replaced online.
(3) After the module has failed, data may not be saved properly. Referring to Section 3.4.15, therefore, prerecord the data to be saved (offset/gain values of Industrial shipment settings and User range settings in the buffer memory).
(4) It is recommended to perform an online module change in the actual system in advance to ensure that it would not affect the other modules by checking the following:
  • Means of cutting off the connection to external devices and its configuration are correct.
  • Switching on/off does not bring any undesirable effect.
(5) Do not install/remove the module to/from the base unit, or the terminal block to/from the module more than 50 times after the first use of the product. (IEC 61131-2 compliant)
Failure to do so may cause malfunction.

(Note)
Dedicated instructions cannot be executed during online module change. When execution of a dedicated instruction is needed to save and restore data, execute it using another system *1.
If no other system exists, restore the data by writing them to the buffer memory.
*1: If the module is mounted on a remote I/O station, execute save/restoration on another system connected to the main base unit. (Saving and restoration cannot be executed by using a system connected to remote I/O station.)

7.1 Online Module Change Conditions

The CPU, MELSECNET/H remote I/O module, A/D converter module, GX Developer and base unit given below are needed to perform an online module change.

(1) CPU

The Process CPU or Redundant CPU are required.
For precautions for multiple CPU system configuration, refer to the QCPU User's Manual (Multiple CPU System).
For precautions for redundant system configuration, refer to the QnPRHCPU User's Manual (Redundant System).

(2) MELSECNET/H remote I/O module

The module of function version D or later is necessary.

(3) A/D converter module

The module of function version C or later is necessary.

(4) GX Developer

GX Developer of Version 7.10L or later is necessary.
GX Developer of Version 8.18U or later is required to perform an online module change on the remote I/O station.

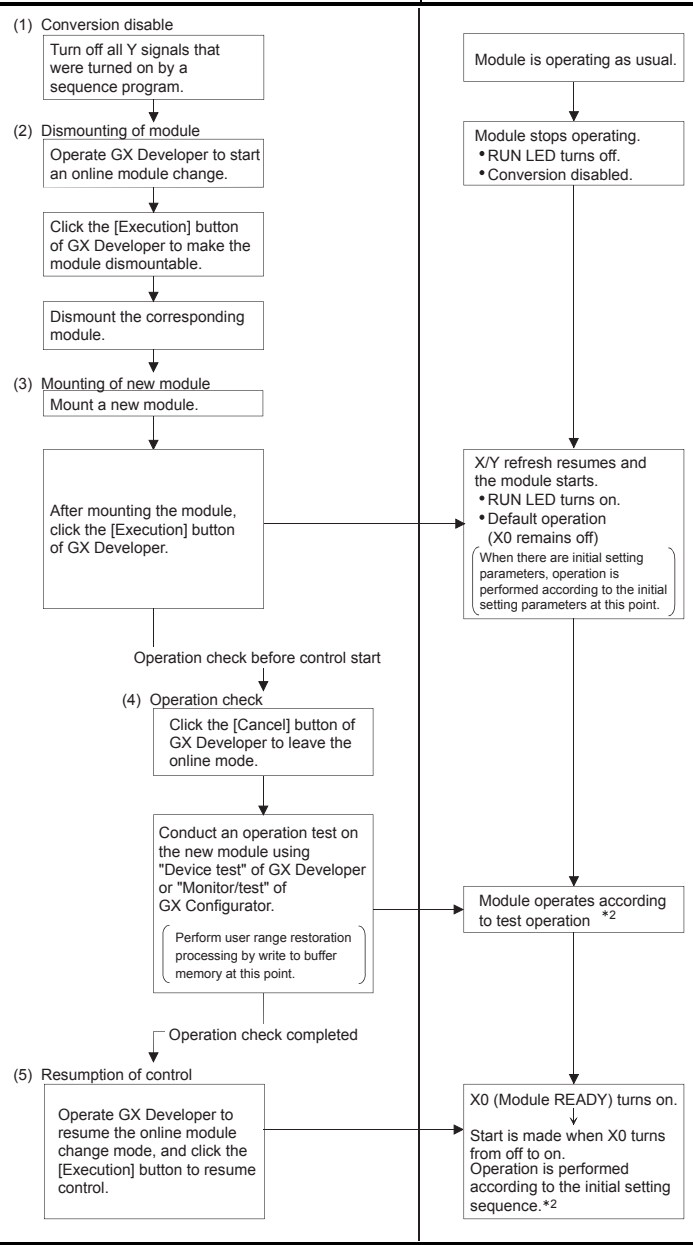
(5) Base unit

1) When the slim type main base unit (Q3□SB) is used, an online module change cannot be performed.
2) When the power supply module unnecessary type extension base unit (Q5□B) is used, online module change cannot be performed for the modules on all the base units connected.

7.2 Online Module Change Operations

The following gives the operations performed for an online module change.

CPU operation ○: Executed ×: Not executed						(User operation)	(Intelligent function module operation)
X/Y refresh	FROM/TO instruction ＊1	Dedicated instruction	Device test	GX Configurator: Initial setting parameter	GX Configurator: Monitor/test		
○	○	○	○	×	○		
×	×	×	×	×	×		
○	×	×	×	○	×		
○	×	×	○	×	○		
○	○	○	○	×	○		


(1) Conversion disable
Turn off all Y signals that were turned on by a sequence program.
(2) Dismounting of module
Operate GX Developer to start an online module change.
Click the [Execution] button of GX Developer to make the module dismountable.
Dismount the corresponding module.
(3) Mounting of new module
Mount a new module.
After mounting the module, click the [Execution] button of GX Developer.
Operation check before control start
(4) Operation check
Click the [Cancel] button of GX Developer to leave the online mode.
Conduct an operation test on the new module using "Device test" of GX Developer or "Monitor/test" of GX Configurator.
Perform user range restoration processing by write to buffer memory at this point.
Operation check completed
(5) Resumption of control
Operate GX Developer to resume the online module change mode, and click the [Execution] button to resume control.
Module is operating as usual.
Module stops operating.
•RUN LED turns off.
•Conversion disabled.
X/Y refresh resumes and the module starts.
•RUN LED turns on.
•Default operation (X0 remains off)
When there are initial setting parameters, operation is performed according to the initial setting parameters at this point.
Module operates according to test operation ＊2
X0 (Module READY) turns on.
Start is made when X0 turns from off to on.
Operation is performed according to the initial setting sequence.＊2

＊1: Access to the intelligent function module device (U□\G□) is included.

＊2: In the absence of the operation marked ＊2, the operation of the intelligent function module is the operation performed prior to that.

7.3 Online Module Change Procedure

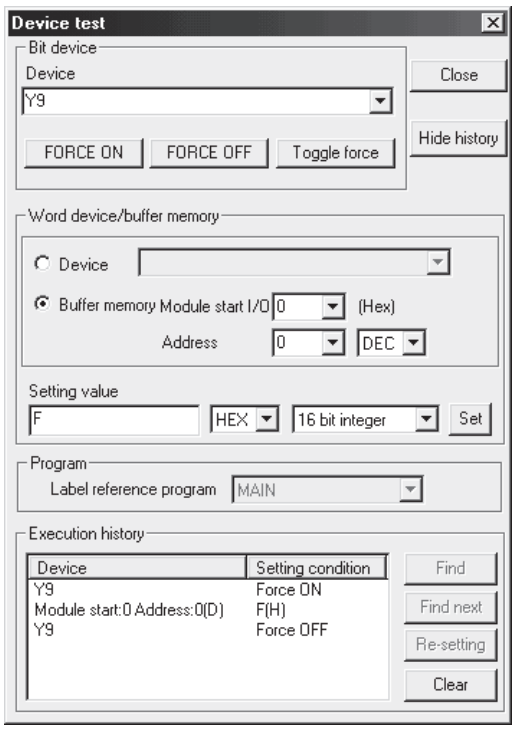
There are the following online module change procedures depending on whether the user range setting has been made or not, whether the initial setting of GX Configurator-AD has been made or not, and whether the other system exists or not.

Range setting	Initial setting	Other system	Reference section
Industrial shipment setting	GX Configurator-AD	—	Section 7.3.1
Industrial shipment setting	Sequence program	—	Section 7.3.2
User range setting	GX Configurator-AD	Present	Section 7.3.3
User range setting	GX Configurator-AD	Absent	Section 7.3.4
User range setting	Sequence program	Present	Section 7.3.5
User range setting	Sequence program	Absent	Section 7.3.6

7.3.1 When industrial shipment setting is used and initial setting was made with GX Configurator-AD

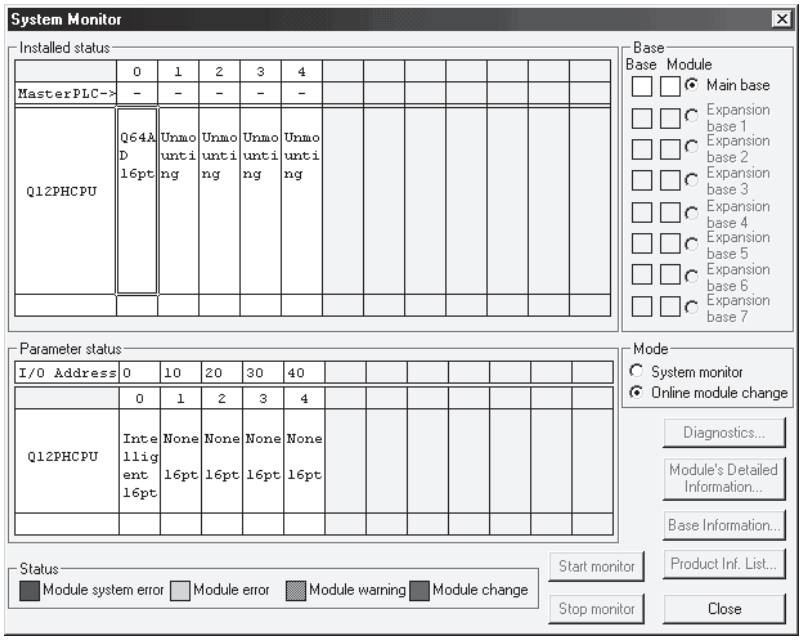
(1) Conversion disable

(a) Set A/D conversion enable/disable setting (buffer memory address 0: Un\G0) for all channel conversion disable and turn Operating condition setting request (Y9) from off to on to stop conversion.
After confirming that conversion has stopped with A/D conversion completed flag (buffer memory address 10: Un\G10), turn off Operating condition setting request (Y9).

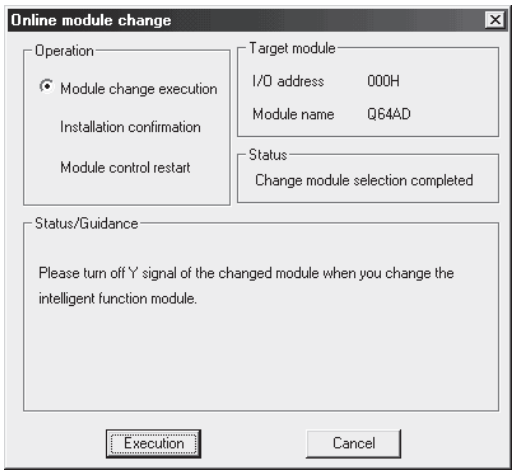


(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, click the [OK] button, dismount the module as-is, and mount a new module.

(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

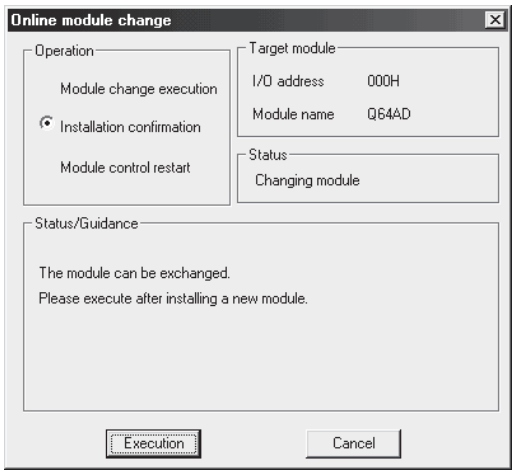
POINT

Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

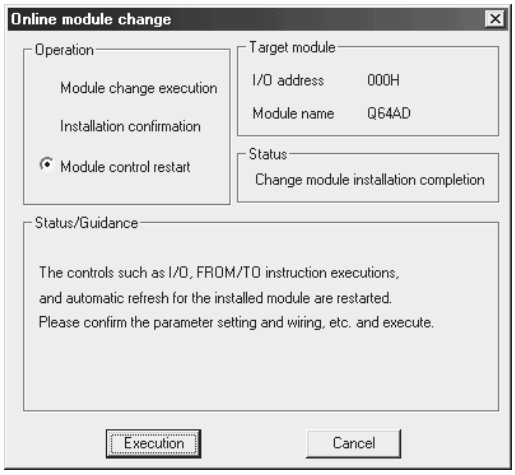
(a) Mount a new module to the same slot and install the terminal block.

(b) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

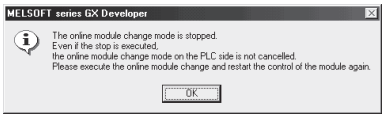


(4) Operation check

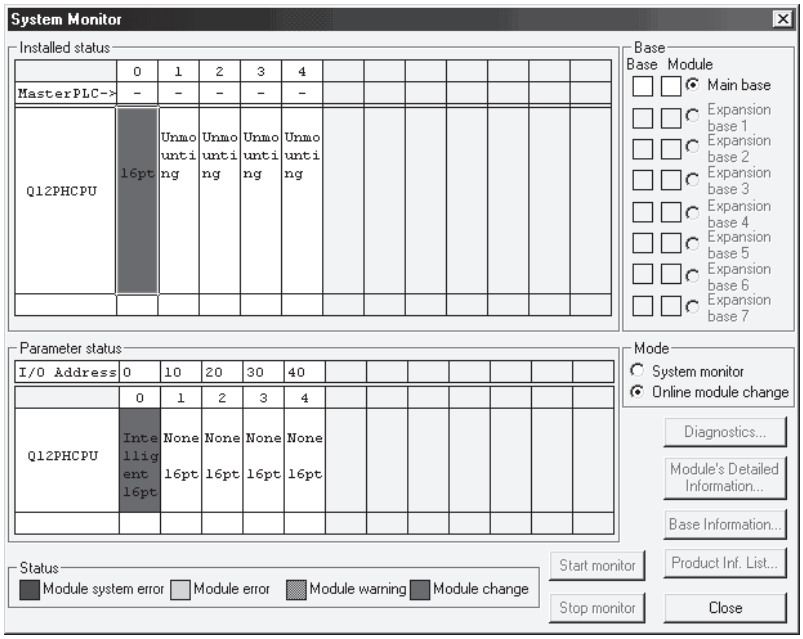
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



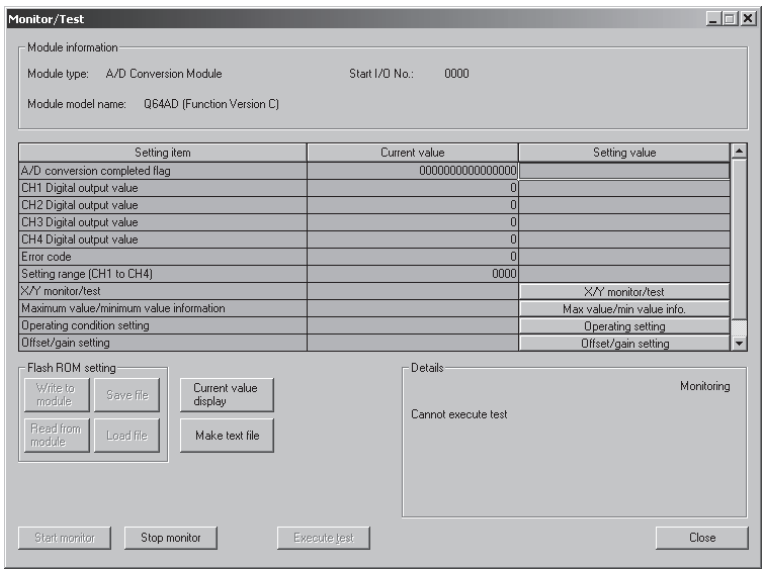
(b) Click the [OK] button to leave the "Online module change" mode.


MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.

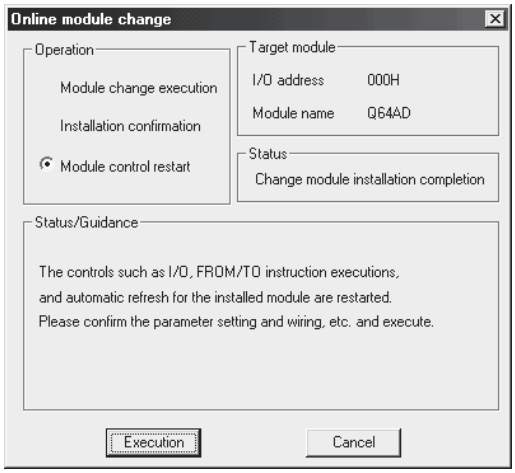


(d) Monitor CH☐ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) to check that proper conversion has been made.



(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.

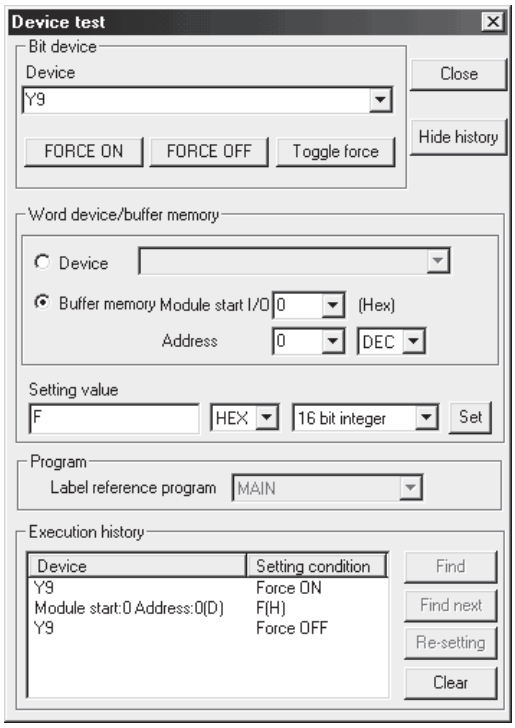


(b) The "Online module change completed" dialog box appears.

7.3.2 When industrial shipment setting is used and initial setting was made with sequence program

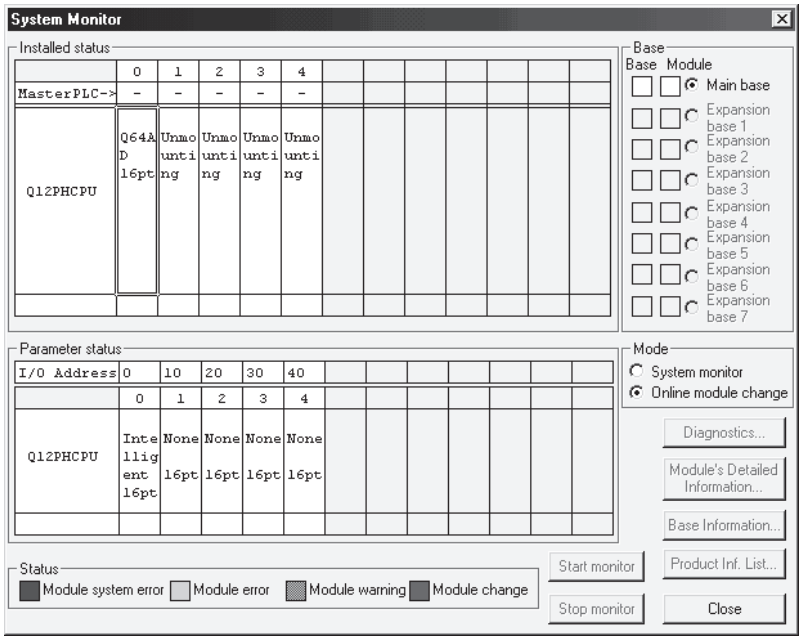
(1) Conversion disable

(a) Set A/D conversion enable/disable setting (buffer memory address 0: Un\G0) for all channel conversion disable and turn Operating condition setting request (Y9) from off to on to stop conversion.
After confirming that conversion has stopped with A/D conversion completed flag (buffer memory address 10: Un\G10), turn off Operating condition setting request (Y9).

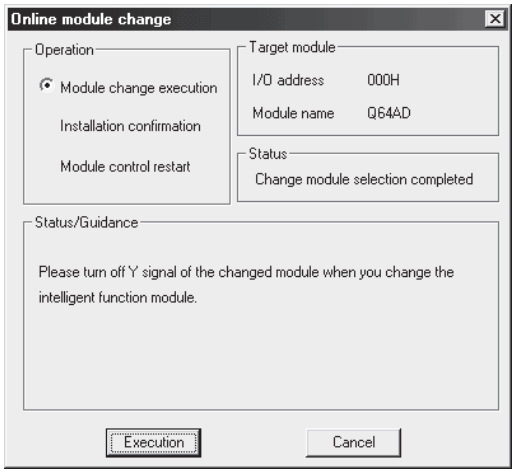


(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, click the [OK] button, dismount the module as-is, and mount a new module.

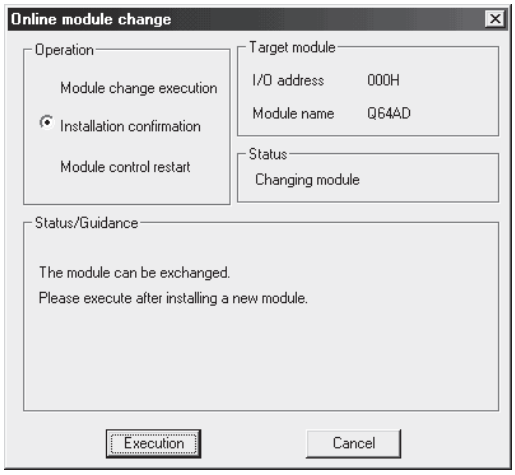
(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

POINT
Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

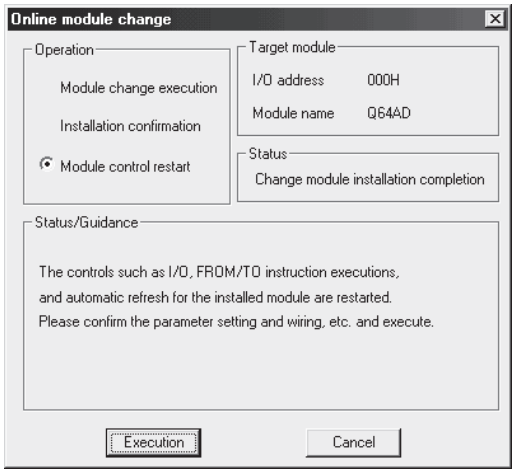
(a) Mount a new module to the same slot and install the terminal block.

(b) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

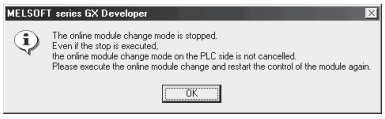


(4) Operation check

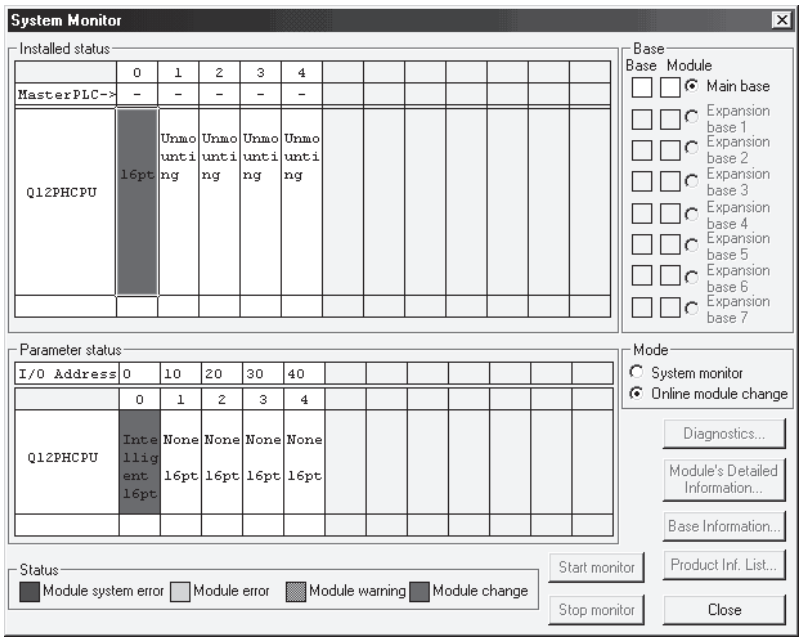
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



(b) Click the [OK] button to leave the "Online module change" mode.


MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.



(d) Set the channels to be used to "A/D conversion enabled" in A/D conversion enable/disable setting (buffer memory address 0: Un\G0) and turn on or off Operating condition setting request (Y9). Monitor CH☐ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) to check whether proper conversion has been made.

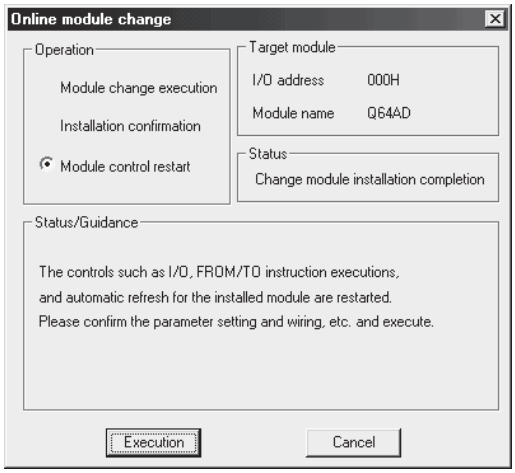
(e) Since the new module is in a default status, it must be initialized by a sequence program after control resumption.
Before performing initialization, check whether the contents of the initialization program are correct or not.

1) Normal system configuration
The sequence program should perform initialization on the leading edge of Module READY (X0) of the A/D converter module.
When control resumption is executed, Module READY (X0) turns on and initialization is performed. (If the sequence program performs initialization only one scan after RUN, initialization is not performed.)

2) When used on remote I/O network
Insert a user device that will execute initialization at any timing (initialization request signal) into the sequence program. After control resumption, turn on the initialization request signal to perform initialization. (If the sequence program performs initialization only for one scan after entering the RUN status, initialization is not performed.)

(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.

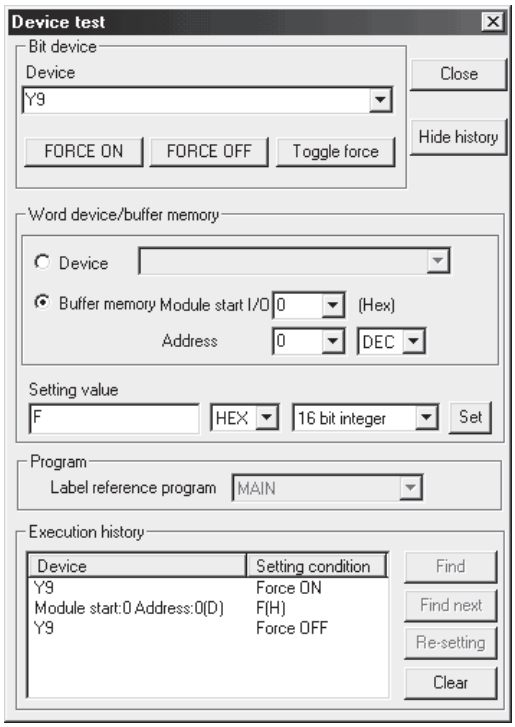


(b) The "Online module change completed" dialog box appears.

7.3.3 When user range setting is used and initial setting was made with GX Configurator-AD (other system is available)

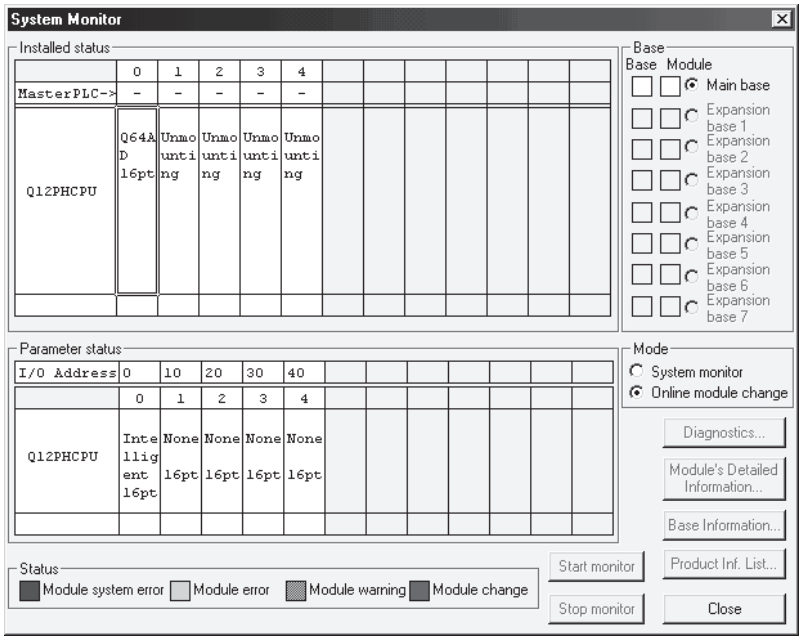
(1) Conversion disable

(a) Set A/D conversion enable/disable setting (buffer memory address 0: Un\G0) for all channel conversion disable and turn Operating condition setting request (Y9) from off to on to stop conversion.
After confirming that conversion has stopped with A/D conversion completed flag (buffer memory address 10: Un\G10), turn off Operating condition setting request (Y9).

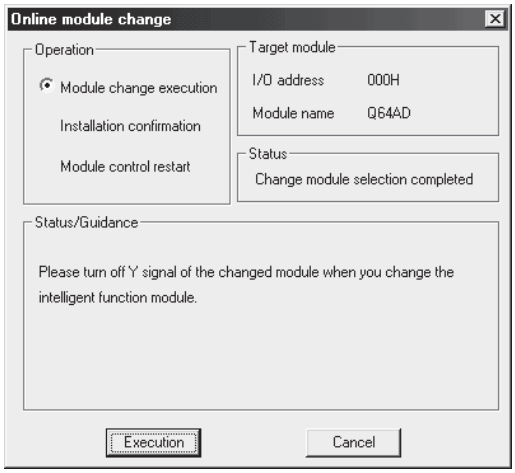


(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, the user range cannot be saved. Click the [OK] button, and perform the operations described in Section 7.3.4 (2)(c) and later.

(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

POINT
Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

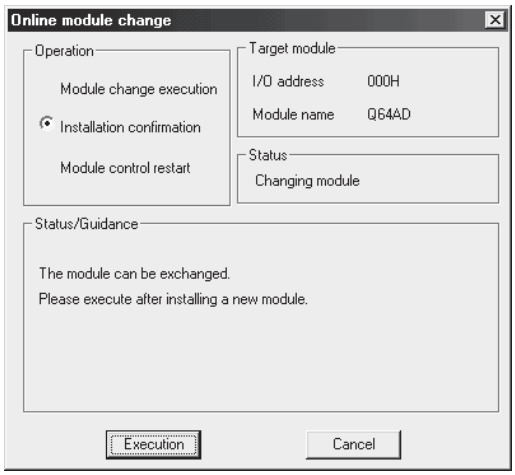
(a) Mount the dismounted module and new module to the other system.

(b) Using the G(P).OGLOAD instruction, save the user set values to the CPU device. Refer to Appendix 2.2 for the G(P).OGLOAD instruction.

(c) Using the G(P).OGSTOR instruction, restore the user set values to the module. Refer to Appendix 2.3 for the G(P).OGSTOR instruction.

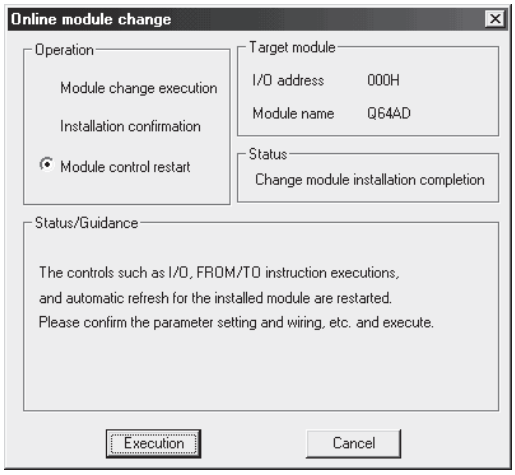
(d) Dismount the new module from the other system, mount it to the slot from where the old module was dismounted in the original system, and install the terminal block.

(e) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

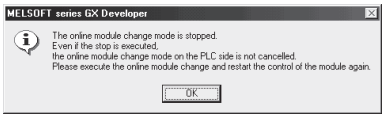


(4) Operation check

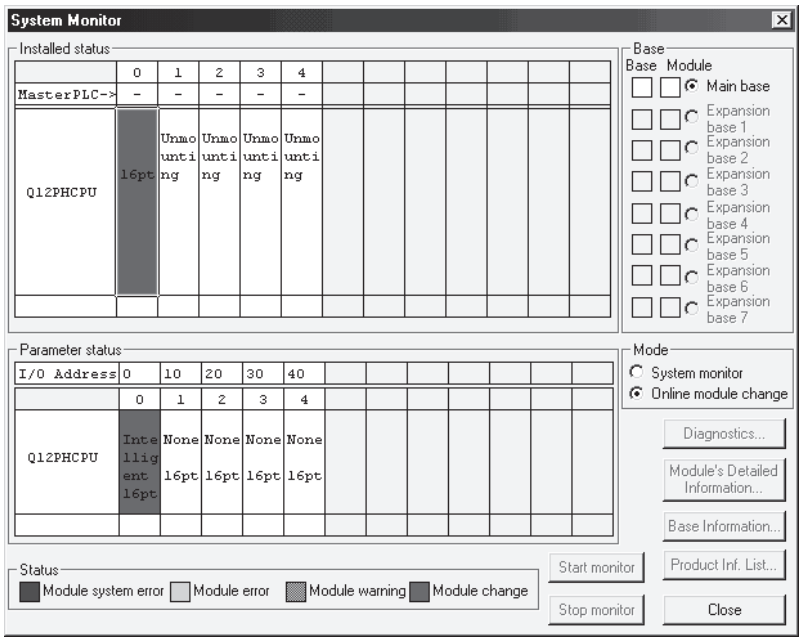
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



(b) Click the [OK] button to leave the "Online module change" mode.

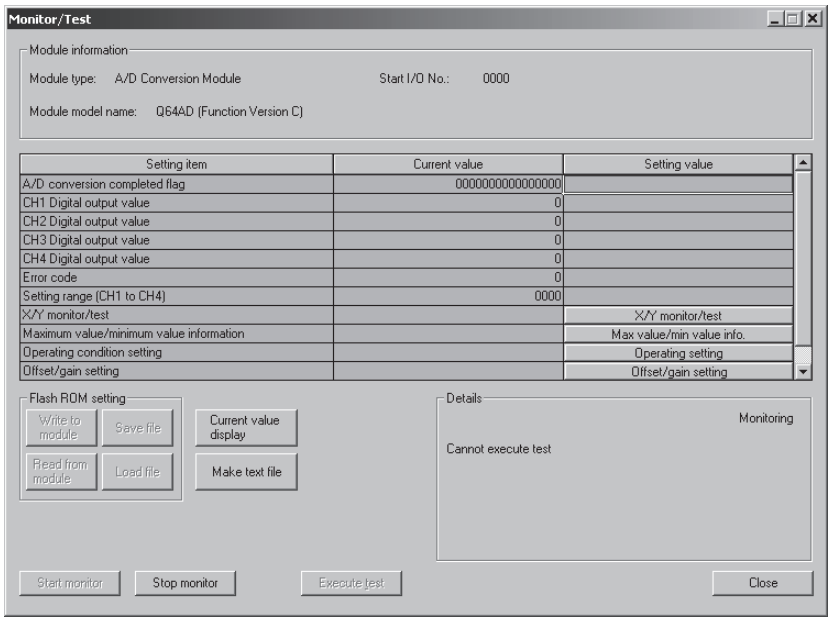

MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.



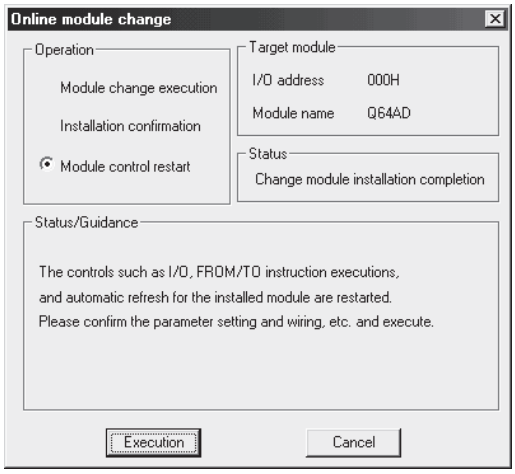
7 - 17

(d) Monitor CH□ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) to check that proper conversion has been made.



(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.

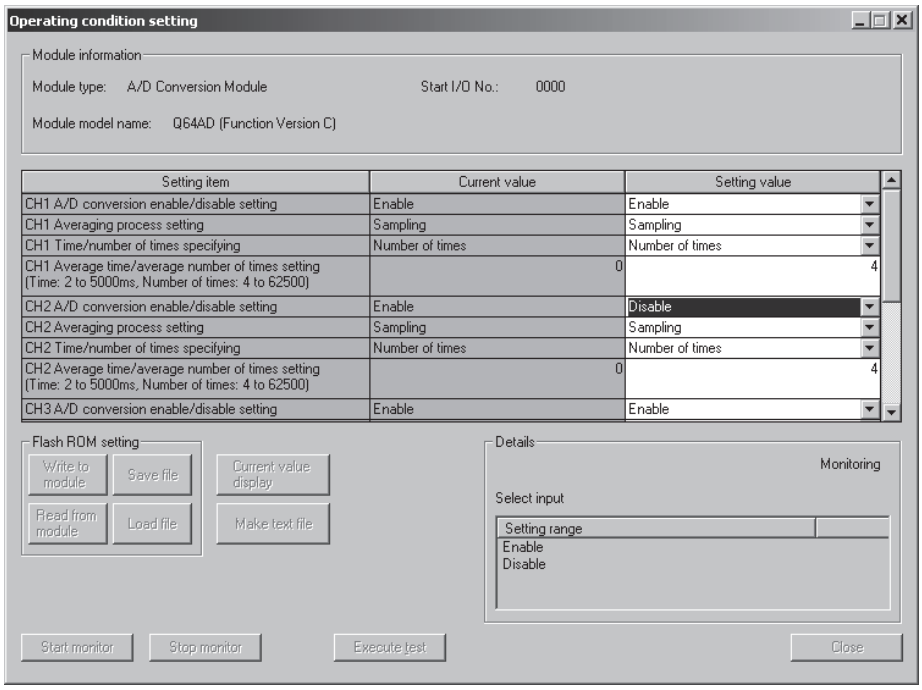


(b) The "Online module change completed" dialog box appears.

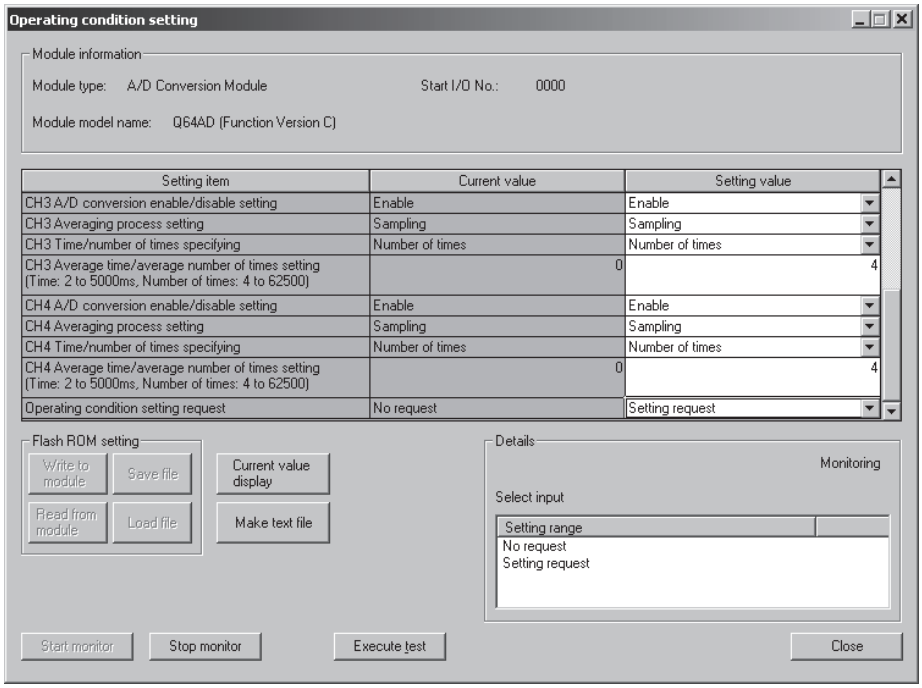
7.3.4 When user range setting is used and initial setting was made with GX Configurator-AD (other system is unavailable)

(1) Conversion disable

(a) On the Operating condition setting screen of GX Configurator-AD, set "Disable" in the Setting value field of CH□ A/D conversion enable/disable setting, and click the [Execute test] button.
Monitor A/D conversion completed flag (buffer memory address 10: Un\G10) and confirm that conversion has stopped.



(b) After making sure that the indication in the Current value field of CH□ A/D conversion enable/disable setting is "Disable", change the Setting value field of Operating condition setting request to "Setting request", and click the [Execute test] button to stop conversion.



(c) If the saved buffer memory contents are not yet prerecorded, record them in the following procedure.

1) Display the pass data screen of GX Configurator-AD.
2) Set Pass data classification setting *1 and make a pass data read request. (Refer to Section 5.6.5, 5.6.6.)
3) Compare the current values of Industrial shipment settings and User range settings offset/gain values with those of the range reference table. Refer to Section 7.4 for the range reference table.
4) If the values are proper, record the offset/gain values of the pass data classification setting, industrial shipment settings and user range settings.

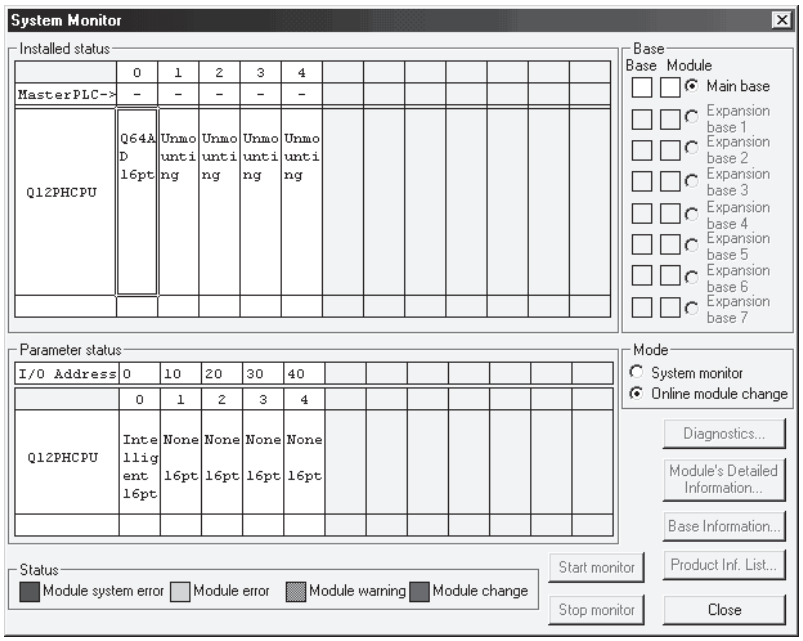
*1: The Q68ADV/Q68ADI does not require the setting and recording of Pass data classification setting.

POINT

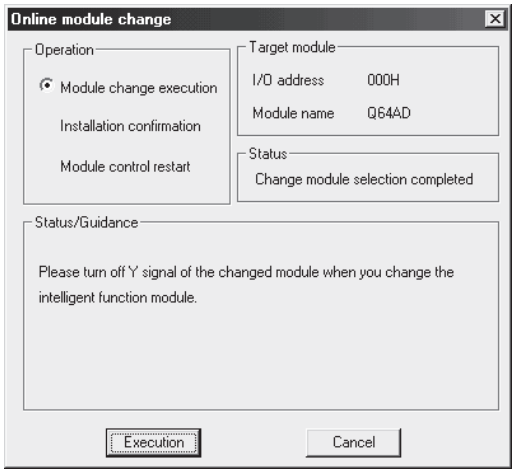
If the buffer memory values compared with the reference table are not proper, save and restoration of the user range cannot be executed.
Before executing module control resumption, make offset/gain setting in GX Configurator-AD. (refer to Section 5.6.2)
Note that if module control is resumed without offset/gain setting being made, operation will be performed with the default values.

(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, the user range cannot be saved. Click the "OK" button, and execute the operations described (2)(c) or later in this section.

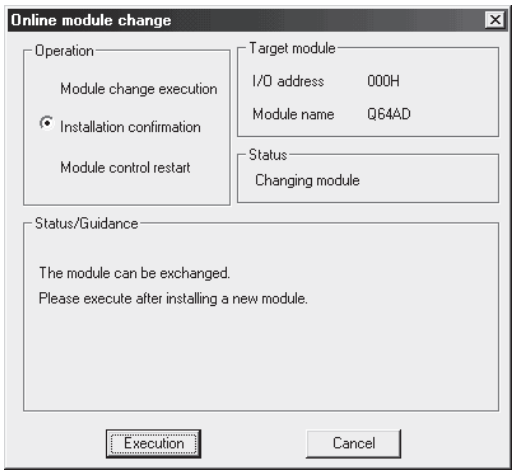
(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

POINT
Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

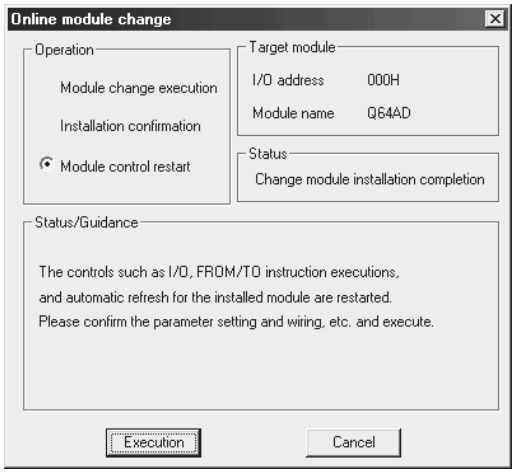
(a) Mount a new module to the same slot and install the terminal block.

(b) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

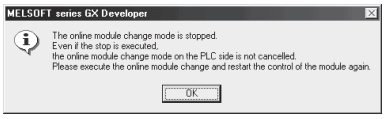


(4) Operation check

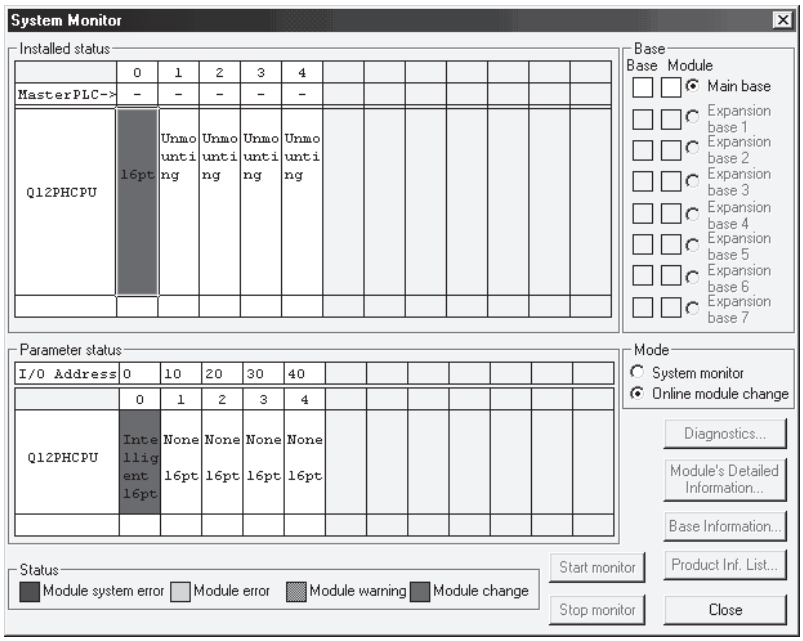
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



(b) Click the [OK] button to leave the "Online module change" mode.

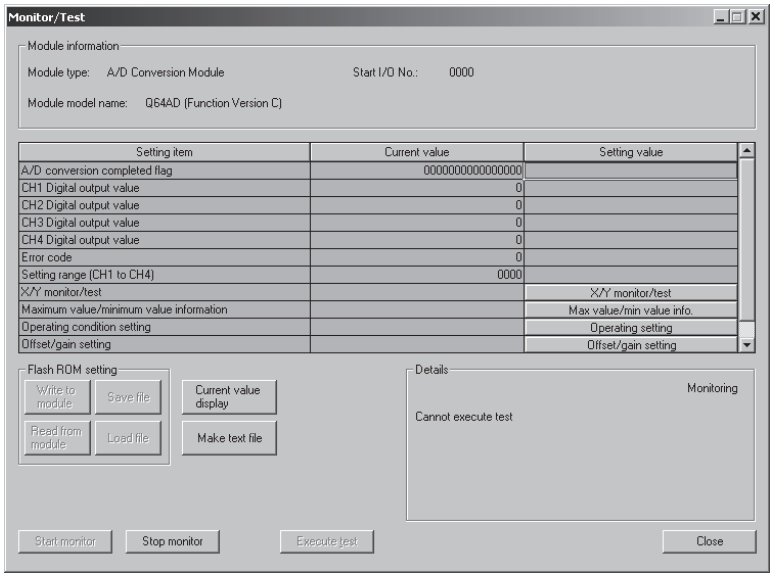

MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.



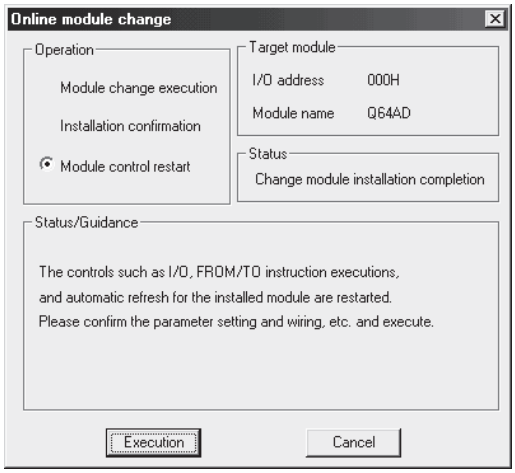
(d) On the pass data screen of GX Configurator-AD, set the prerecorded values and perform User range writing request. (Refer to Section 5.6.5, 5.6.6)

(e) Monitor CH☐ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\18) to check that proper conversion has been made.



(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.

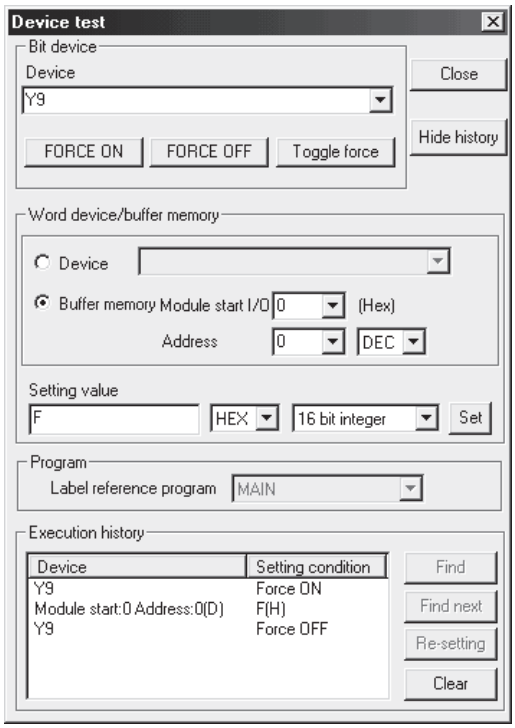


(b) The "Online module change completed" dialog box appears.

7.3.5 When user range setting is used and initial setting was made with sequence program (other system is available)

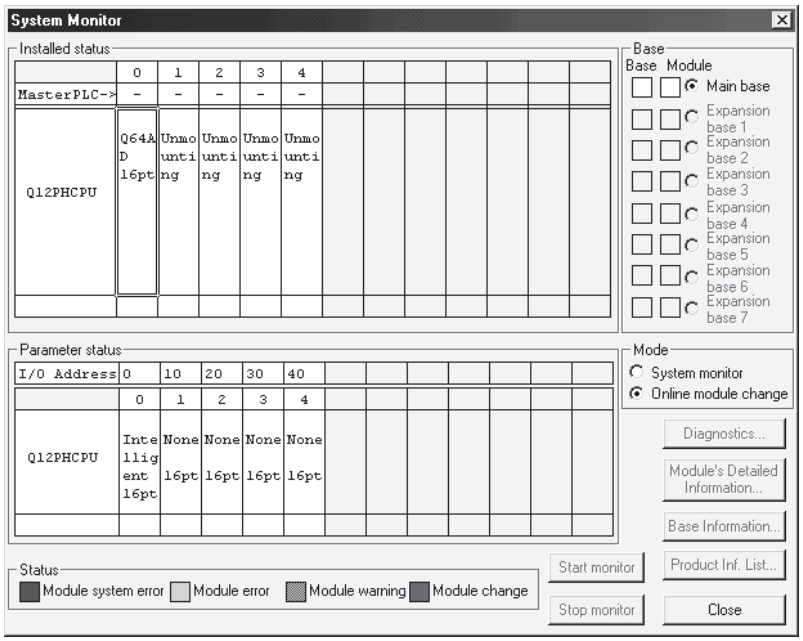
(1) Conversion disable

(a) Set A/D conversion enable/disable setting (buffer memory address 0: Un\G0) for all channel conversion disable and turn Operating condition setting request (Y9) from off to on to stop conversion.
After confirming that conversion has stopped with A/D conversion completed flag (buffer memory address 10: Un\G10), turn off Operating condition setting request (Y9).

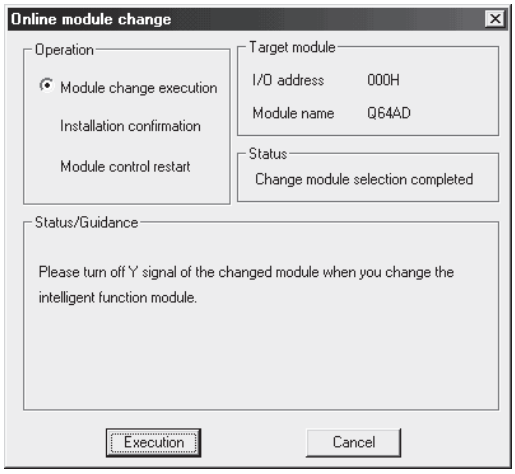


(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, the user range cannot be saved. Click the [OK] button, and perform the operations described in Section 7.3.6 (2)(c) and later.

(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

POINT
Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

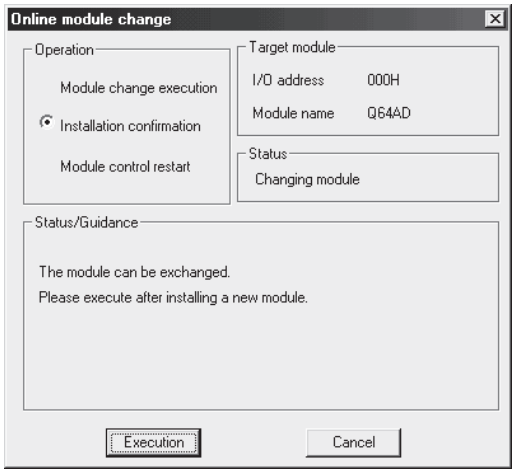
(a) Mount the dismounted module and new module to the other system.

(b) Using the G(P).OGLOAD instruction, save the user set values to the CPU device. Refer to Appendix 2.2 for the G(P).OGLOAD instruction.

(c) Using the G(P).OGSTOR instruction, restore the user set values to the module. Refer to Appendix 2.3 for the G(P).OGSTOR instruction.

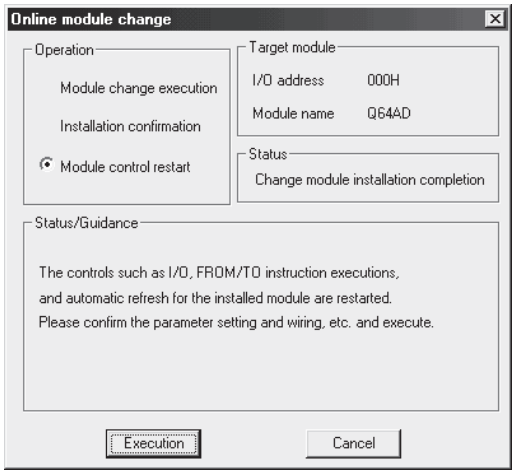
(d) Dismount the new module from the other system, mount it to the slot from where the old module was dismounted in the original system, and install the terminal block.

(e) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

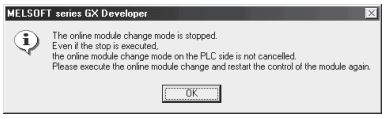


(4) Operation check

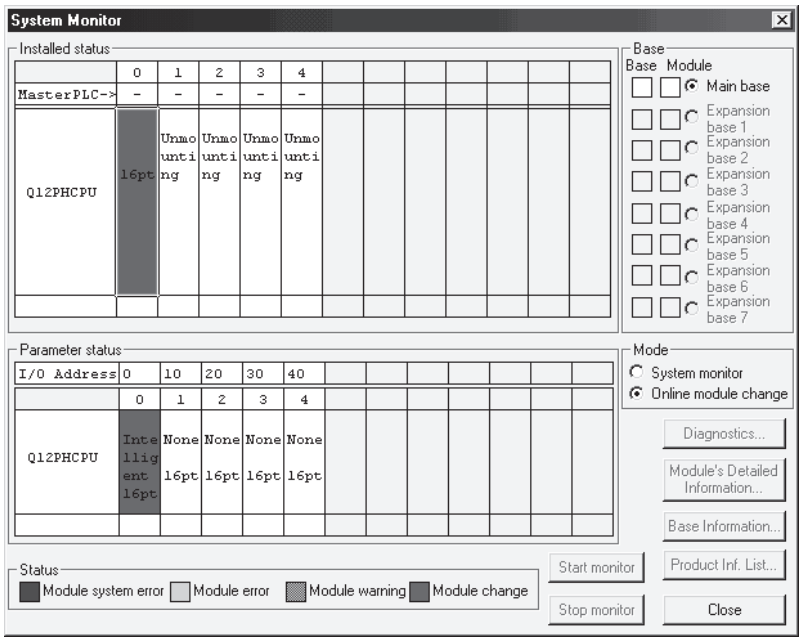
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



(b) Click the [OK] button to leave the "Online module change" mode.


MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.



(d) Set the channels to be used to "A/D conversion enabled" in A/D conversion enable/disable setting (buffer memory address 0: Un\G0) and turn on or off Operating condition setting request (Y9). Monitor CH☐ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) to check whether proper conversion has been made.

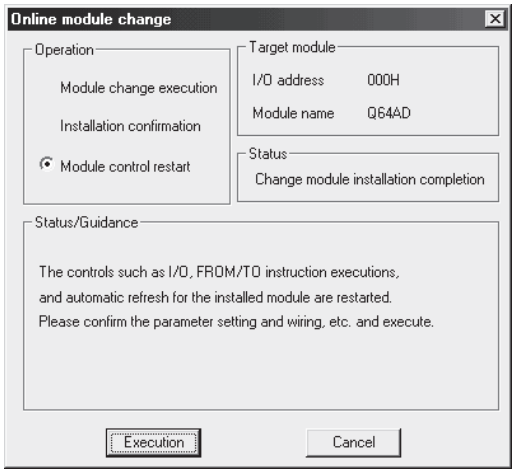
(e) Since the new module is in a default status, it must be initialized by a sequence program after control resumption.
Before performing initialization, check whether the contents of the initialization program are correct or not.

1) Normal system configuration
The sequence program should perform initialization on the leading edge of Module READY (X0) of the A/D converter module.
When control resumption is executed, Module READY (X0) turns on and initialization is performed. (If the sequence program performs initialization only one scan after RUN, initialization is not performed.)

2) When used on remote I/O network
Insert a user device that will execute initialization at any timing (initialization request signal) into the sequence program. After control resumption, turn on the initialization request signal to perform initialization. (If the sequence program performs initialization only for one scan after entering the RUN status, initialization is not performed.)

(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.

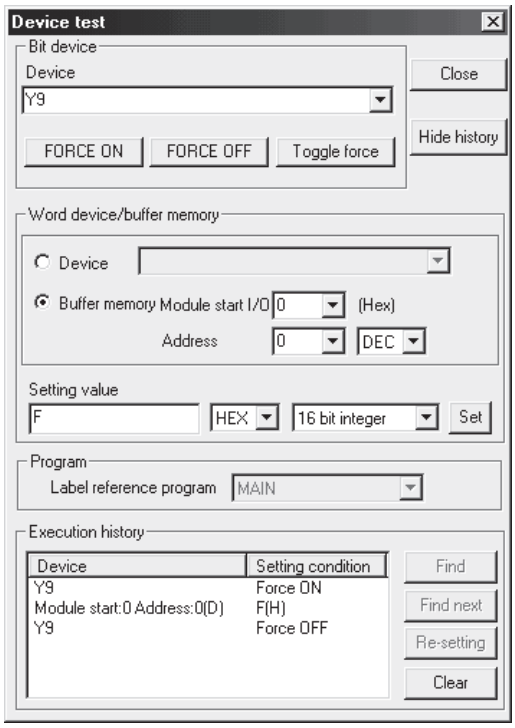


(b) The "Online module change completed" dialog box appears.

7.3.6 When user range setting is used and initial setting was made with sequence program (other system is unavailable)

(1) Conversion disable

(a) Set A/D conversion enable/disable setting (buffer memory address 0: Un\G0) for all channel conversion disable and turn Operating condition setting request (Y9) from off to on to stop conversion.
After confirming that conversion has stopped with A/D conversion completed flag (buffer memory address 10: Un\G10), turn off Operating condition setting request (Y9).



(b) If the saved buffer memory contents are not yet prerecorded, record them in the following procedure.

1) Make Pass data classification setting (buffer memory address 200: Un\G200)*1.
2) Turn Operating condition setting request (Y9) from off to on.
3) Compare the offset/gain values of Industrial shipment settings and User range settings (buffer memory address 202 to 233: Un\G202 to Un\G233) with the range reference table. Refer to Section 7.4 for the range reference table.
4) If the values are proper, record the offset/gain values of Pass data classification setting*1, Industrial shipment settings and User range settings.

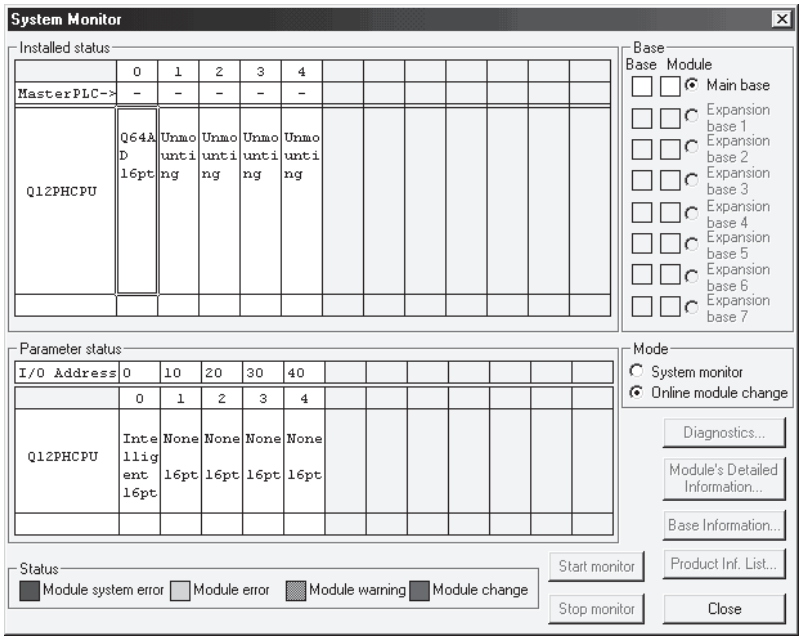
*1: The Q68ADV/Q68ADI does not require the setting and recording of Pass data classification setting.

POINT

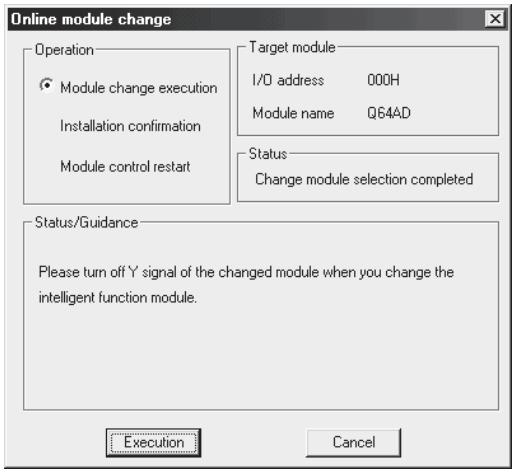
If the buffer memory values compared with the reference table are not proper, save and restoration of the user range cannot be executed.
Before executing module control resumption, follow the flowchart in Section 4.6 and make offset/gain setting in the device test of GX Developer.
Perform mode switching by making the setting of Mode switching setting (buffer memory address 158, 159: Un\G158, Un\G159) and turning Operating condition setting request (Y9) from off to on.
Note that if module control is resumed without offset/gain setting being made, operation will be performed with the default values.

(2) Dismounting of module

(a) After choosing [Diagnosis] - [Online module change] on GX Developer to enter the "Online module change" mode, double-click the module to be changed online to display the "Online module change" dialog box.



(b) Click the "Execution" button to enable a module change.



If the following error dialog box appears, the user range cannot be saved. Click the "OK" button, and execute the operations described in (2)(c) or later in this section.

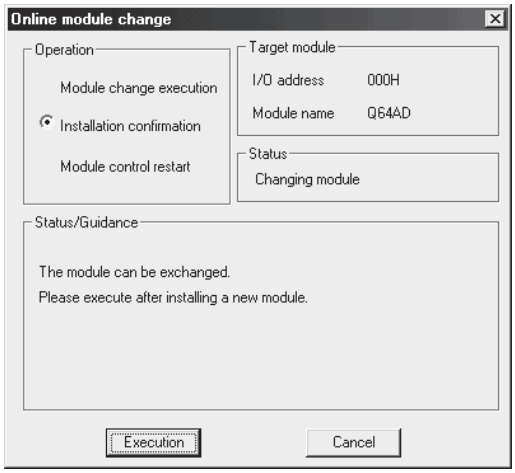
(c) After confirming that the "RUN" LED of the module has turned off, remove the terminal block and dismount the module.

POINT
Always dismount the module. If mounting confirmation is made without the module being dismounted, the module will not start properly and the "RUN" LED will not be lit.

(3) Mounting of new module

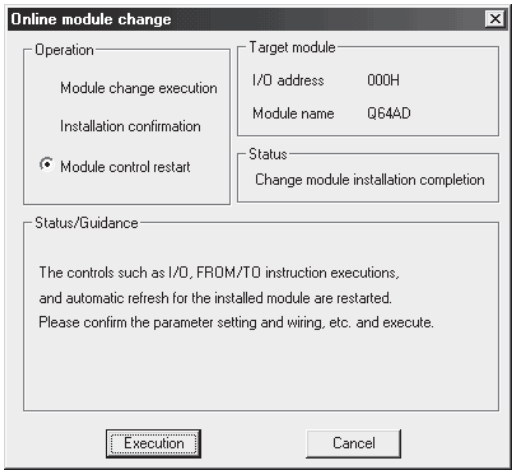
(a) Mount a new module to the same slot and install the terminal block.

(b) After mounting the module, click the [Execution] button and make sure that the "RUN" LED is lit. Module READY (X0) remains off.

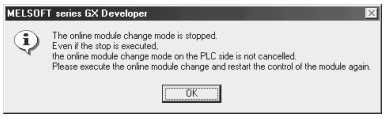


(4) Operation check

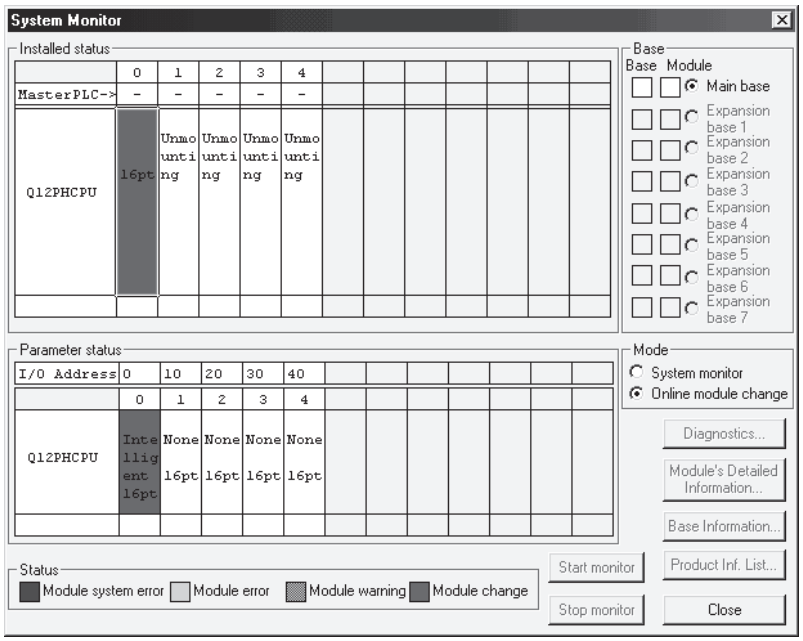
(a) To make an operation check, click the [Cancel] button to cancel control resumption.



(b) Click the [OK] button to leave the "Online module change" mode.


MELSOFT series GX Developer
The online module change mode is stopped.
Even if the stop is executed,
the online module change mode on the PLC side is not cancelled.
Please execute the online module change and restart the control of the module again.
OK

(c) Click the [Close] button to close the System monitor dialog box.



(d) Choose [Online] - [Debug] - [Device test] on GX Developer and set the prerecorded values to the buffer memory.

(e) Turn User range writing request (YA) from off to on to restore the user set values to the module.
After confirming that Offset/gain setting mode flag (XA) is on, turn off User range writing request (YA).

(f) Set the channels to be used to "A/D conversion enabled" in A/D conversion enable/disable setting (buffer memory address 0: Un\G0) and turn on or off Operating condition setting request (Y9). Monitor CH□ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18) to check whether proper conversion has been made or not.

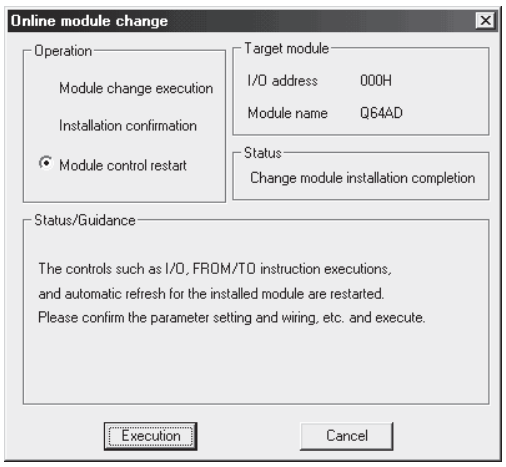
(g) Since the new module is in a default status, it must be initialized by a sequence program after control resumption.
Before performing initialization, check whether the contents of the initialization program are correct or not.

1) Normal system configuration
The sequence program should perform initialization on the leading edge of Module READY (X0) of the A/D converter module.
When control resumption is executed, Module READY (X0) turns on and initialization is performed. (If the sequence program performs initialization only one scan after RUN, initialization is not performed.)

2) When used on remote I/O network
Insert a user device that will execute initialization at any timing (initialization request signal) into the sequence program. After control resumption, turn on the initialization request signal to perform initialization. (If the sequence program performs initialization only for one scan after entering the RUN status, initialization is not performed.)

(5) Resumption of control

(a) After choosing the [Diagnostics] - [Online module change] dialog box on GX Developer to display the "Online module change" dialog box again, click the [Execution] button to resume control. Module READY (X0) is turned on.



(b) The "Online module change completed" dialog box appears.

7.4 Range Reference Table

The range reference tables are given below.

(1) Reference table for Industrial shipment settings offset/gain values (buffer memory address 202 to 217: Un\G202 to Un\G217)

(a) For the Q64AD

The reference values change depending on the setting of Pass data classification setting (buffer memory address 200: Un\G200).

Address (Decimal)				Description	Pass data classification setting	Reference value (Hexadecimal)
CH1	CH2	CH3	CH4			
202	204	206	208	Industrial shipment settings offset value	Voltage specified	Approx. 800C$_H$
					Current specified	Approx. 800C$_H$
203	205	207	209	Industrial shipment settings gain value	Voltage specified	Approx. FA64$_H$
					Current specified	Approx. BD38$_H$

(b) For the Q68ADV

Address (Decimal)								Description	Reference value (Hexadecimal)
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8		
202	204	206	208	210	212	214	216	Industrial shipment settings offset value	Approx. 800C$_H$
203	205	207	209	211	213	215	217	Industrial shipment settings gain value	Approx. FA64$_H$

(c) For the Q68ADI

Address (Decimal)								Description	Reference value (Hexadecimal)
CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8		
202	204	206	208	210	212	214	216	Industrial shipment settings offset value	Approx. 800C$_H$
203	205	207	209	211	213	215	217	Industrial shipment settings gain value	Approx. BD38$_H$

(2) Reference table for User range settings offset/gain values (buffer memory address 218 to 233: Un\G218 to Un\G233)

Example: When the offset value and gain value of channel 1 are 1V and 5V respectively in the Q68ADV, the reference value of CH1 User range settings offset value (buffer memory address 218: Un\G218) is approx. 8C46$_H$ and that of CH1 User range settings gain value (buffer memory address 219: Un\G219) is approx. BD38$_H$.

Offset/gain value		Reference value (Hexadecimal)
Voltage	0V	Approx. 800C$_H$
	1V	Approx. 8C46$_H$
	5V	Approx. BD38$_H$
	10V	Approx. FA64$_H$
Current	0mA	Approx. 800C$_H$
	4mA	Approx. 8C46$_H$
	20mA	Approx. FA64$_H$

7.5 Precautions for Online Module Change

The following are the precautions for online module change.

(1) Always perform an online module change in the correct procedure. A failure to do so can cause a malfunction or failure.

(2) If an online module change is made with the user range setting, the accuracy after that will fall to about less than three times of the accuracy before that. Re-set the offset/gain values as necessary.

(3) Do not perform online module change during setting the offset/gain mode. (If performed, the A/D converter module may not operate properly.)

(4) Do not perform the following operations during online module change. If performed, the A/D converter module may not operate properly.
(a) Powering off the programmable controller CPU.
(b) Resetting the programmable controller CPU.

8 TROUBLESHOOTING

The following section explains the types of errors that may occur when the A/D converter module is used, and how to troubleshoot such errors.

8.1 Error Code List

If an error occurs in the A/D converter module while writing to or reading data from the programmable controller CPU, the applicable error code is written to buffer memory address 19 (Un\G19).

Table 8.1 Error code list

Error code (decimal)	Error description	Processing
10□	The input range is set an illegal value using the intelligent function module switch in GX Developer. □ indicates the incorrectly specified channel number.	Reset to the correct parameter with GX Developer parameter setting. (refer to Section 4.5.)
111	Module error at startup.	Turn the power off and on again. If the error occurs again, the module may be malfunctioning. Contact the nearest distributor or branch office with the description of the problem.
161 ＊1	The G(P).OGSTOR instruction was executed in the offset/gain setting mode.	Do not execute the G(P).OGSTOR instruction in the offset/gain setting mode.
162 ＊2	• The G(P).OGSTOR instruction was executed consecutively. • At the time of offset/gain setting, a set value was written to the E^2PROM 26 or more times.	• Execute the G(P).OGSTOR instruction only once for one module. • At the time of offset/gain setting, write a set value only once at one time.
163 ＊2	The G(P).OGSTOR instruction was executed for the model that differs from the model for which the G(P).OGLOAD instruction had been executed.	Execute the G(P).OGLOAD and G(P).OGSTOR instructions for the same model.
20□ ＊3	The average time setting value for CH□ Average time/average number of times (buffer memory address 1 to 8: Un\G1 to Un\G8) is outside the range of 2 to 5000 ms. □ indicates the incorrectly specified channel number.	Reset the average time setting to a value within the range of 2 to 5000 ms.
30□ ＊3	The average number of times setting value for CH□ Average time/average number of times (buffer memory address 1 to 8: Un\G1 to Un\G8) is outside the range of 4 to 62500 times. □ indicates the incorrectly specified channel number.	Reset the average number of times setting value to within the range of 4 to 62500 times.
40□ ＊3＊4	The offset value is equal to or greater than the gain value at the time of user range setting or user range restoration. □ indicates the error causing channel number.	Reset so that the offset value becomes smaller than the gain value.
500 ＊3	The offset/gain channels were set at the same time during offset and gain value settings, or both were set to 0.	Reset the contents of Offset/gain setting mode Offset/gain specifications (buffer memory address 22, 23: Un\G22, Un\G23).

＊1: Not written to Error code (buffer memory address 19: Un\G19). Written to the completion status area (S)+1 of the G(P).OGSTOR instruction.

POINT

(1) If more than one error occurs, the error code first detected by the A/D converter module is stored. No other error codes will be stored.
(2) Error code marked with ＊2 can be cleared by turning on Error clear request (YF).
(3) Error code marked with ＊3 can be cleared by either turning on Error clear request (YF), or turning on Operating condition setting request (Y9) after changing the setting value within the buffer memory setting range.
(4) The error is cleared at the time of mode switching.
(5) Error code marked with ＊4 may occur if the offset and gain values do not meet the conditions shown in POINT in Section 3.1.2 (1) or Section 3.1.2 (2).
Set the offset and gain values that meet the conditions shown in POINT in Section 3.1.2 (1) or Section 3.1.2 (2).

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8.2 Troubleshooting

8.2.1 When the "RUN" LED is flashing or turned off

(1) When flashing

Check item	Corrective action
Is the mode set to the offset/gain setting mode?	Reset switch 4 of the intelligent function module setting for GX Developer to the normal mode (refer to Section 4.5).

(2) When off

Check item	Corrective action
Is the power being supplied?	Confirm that the supply voltage for the power supply module is within the rated range.
Is the capacity of the power supply module adequate?	Calculate the current consumption of the CPU module, I/O module and intelligent function module mounted on the base unit to see if the power supply capacity is adequate.
Has a watchdog timer error occurred?	Reset the programmable controller CPU and verify that it is lit. If the RUN LED does not light even after doing this, the module may be malfunctioning. Contact the nearest distributor or branch office with a description of the problem.
Is the module correctly mounted on the base unit?	Check the mounting condition of the module.
Is a module change enabled during an online module change?	Refer to Chapter 7 and take corrective action.

8.2.2 When the "ERROR" LED is on or flashing

(1) When on

Check item	Corrective action
Is an error being generated?	Confirm the error code and take corrective action described in Section 8.1.

(2) When flashing

Check item	Corrective action
Is intelligent function module setting switch 5 set to "other than 0"?	Using GX Developer parameter setting, set intelligent function module setting switch 5 to "0" (refer to Section 4.5).

8.2.3 When the digital output values cannot be read

Check item	Corrective action
Is there any fault with the analog signal lines such as disconnection?	Check for faulty condition of the lines visually and perform a continuity check of the signal lines.
Is the CPU module in the STOP status?	Set the CPU module to the RUN status.
Are the offset/gain settings correct?	Verify that the offset/gain settings are correct (refer to Sections 4.6, 5.6.2 and 5.6.3). If the user range is being used, switch to a different default input range and check if A/D conversion is correctly performed. If it is correctly performed, redo the offset/gain settings.
Is the input range setting correct?	Check Setting range (buffer memory address 20, 21: Un\G20, Un\G21) in GX Developer system monitor. If the input range setting is incorrect, reset the intelligent function module switch of GX Developer (refer to Section 4.5).
Is the resolution mode setting correct?	Check the on/off status of High resolution mode status flag (X8) in GX Developer system monitor. If the resolution mode setting is incorrect, reset the intelligent function module switch of GX Developer. (refer to Section 4.5.)
Is A/D conversion enable/disable setting for the channels to use set to A/D conversion disabled?	Check the on/off status with A/D conversion enable/disable setting (buffer memory address 0: Un\G0) in GX Developer system monitor and review the initial setting of the sequence program or utility package (refer to Section 3.4).
Has Operating condition setting request (Y9) been executed?	From GX Developer, set Operating condition setting request (Y9) from on to off, and check if a digital output value is stored in CH□ Digital output value (buffer memory address 11 to 18: Un\G11 to Un\G18). If so, review the initial setting of the sequence program or utility package (refer to Section 3.3).

POINT

The module may be faulty if Digital output value cannot be read after proper corrective actions have been taken according to the above check items. Consult the nearest representative or branch.

8.2.4 Checking the A/D converter module status using GX Developer system monitor

When the A/D converter module detail information is selected in GX Developer system monitor, Error code, LED on status and status of the intelligent function module switch setting can be checked.

(1) Operating GX Developer

[Diagnostics] → [System monitor] → Select the A/D converter module to check the status → Module's Detailed Information

(2) Module Detail Information

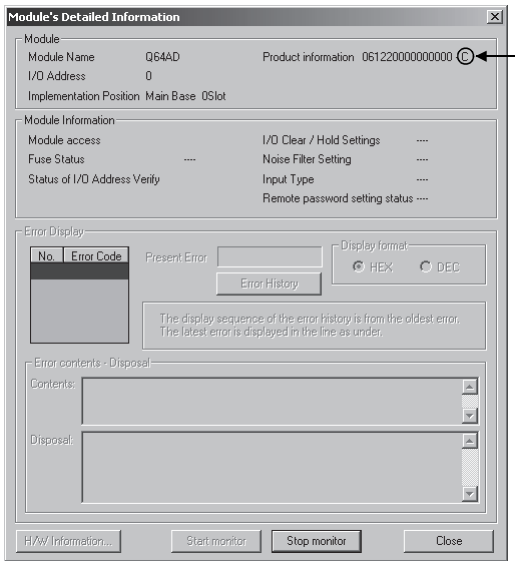
(a) Checking the function version

The function version of the A/D converter module is displayed in the product information field.

(b) Checking Error code

The error code stored in buffer memory address 19 (Un\G19) of the A/D converter module is displayed in the Present Error field.

(When the Error History button is pressed, the contents displayed in the Present Error field are displayed in the No. 1 field.)



(3) H/W information

(a) H/W LED information

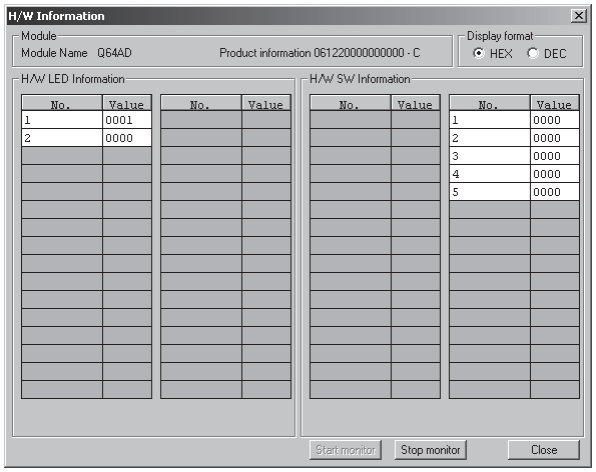
The LED on status is displayed.

No.	LED name	Status
1	RUN LED	0000H : Indicates that LED is unlit.
2	ERROR LED	0001H : Indicates that LED is lit

(b) H/W SW information

The status of the intelligent function module switch setting is displayed.

No.	Switch setting for intelligent function module
1	Switch 1
2	Switch 2
3	Switch 3
4	Switch 4
5	Switch 5



MEMO

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APPENDICES

Appendix 1 Function Upgrade for the A/D Converter Module

The A/D converter modules of function versions B and C have more functions than the conventional model (function version A).
This section describes a comparison of functions of the A/D converter module based on the function additions, combinations with GX Configurator-AD software version and precautions when replacing the module.

Appendix 1.1 A comparison of functions of the A/D converter module

The following table indicates the functions supported by the corresponding function versions.

Function	Function version A	Function version B	Function version C
A/D conversion enable/disable setting	○	○	○
A/D conversion method	—	—	—
Sampling processing	○	○	○
Averaging processing	○	○	○
Maximum and minimum values hold function	○	○	○
Temperature drift compensation function	○	○	○
Multiple CPU system compatibility	×	○	○
Resolution mode	—	—	—
Normal resolution mode	○	○	○
High resolution mode	×	○	○
High resolution mode status flag (X8)	×	○	○
Maximum value/minimum value reset completed flag (XD)	×	○	○
Online module change	×	×	○
Switching between normal mode and offset/gain setting mode	—	—	—
Dedicated instruction (G(P).OFFGAN)	×	×	○
Buffer memory (Mode switching setting) and Operating condition setting request (Y9)	×	×	○
GX Configurator-AD	×	×	○
Intelligent function module switch setting	○	○	○

○ : Compatible × : Not compatible

A

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Appendix 1.2 Combinations of A/D converter module functions and GX Configurator-AD software versions

The following table indicates the A/D converter module functions and corresponding GX Configurator-AD software versions.

Function	Software version			
	SW0D5C-QADU -E 00A	SW0D5C-QADU -E 10B	GX Configurator-AD Version 1.10L to 1.15R	GX Configurator-AD Version 1.16S or later
Normal resolution mode	○	○	○	○
High resolution mode ＊1	×	×	○	○
High resolution mode status flag (X8) ＊1 ＊2	×	×	○	○
Maximum value/minimum value reset completed flag (XD) ＊1 ＊2	×	×	○	○
Multiple CPU system compatibility ＊1	×	×	○	○
Normal mode - offset/gain setting mode switching ＊3	×	×	×	○

○ : Compatible × : Not compatible

＊1 Functions added by function version B.
＊2 When the A/D converter module is function version A and the GX Configurator-AD software version is the SW0D5C-QDAU-E 20C or later or GX Configurator-AD Version 1.10L or later, OFF is always displayed.
＊3 Functions added by function version C.

Appendix 1.3 Precautions for replacing the module of function version A with the one of function version B or later

(1) Incorporation into an existing system

You can use the wiring designed for function version A as-is to mount the A/D converter module of function version B or later.

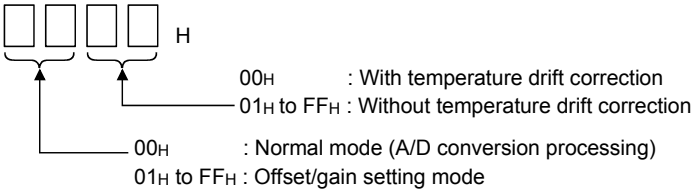
(2) Program utilization

You can use the program created for function version A as-is with the A/D converter module of function version B or later.

(3) Switch setting for intelligent function module

The setting of the offset/gain setting mode differs between function versions A and B or later.
Perform the offset/gain settings after checking the RUN LED flashes in offset/gain setting mode. If the RUN LED does not flash, check to see if the switch 4 setting is correct.
(Refer to Section 4.5 for the intelligent function module switch setting of function version B or later.)

<Contents of switch 4 setting for function version A>


□□□□ H
00H : With temperature drift correction
01H to FFH : Without temperature drift correction
00H : Normal mode (A/D conversion processing)
01H to FFH : Offset/gain setting mode

A

Appendix 2 Dedicated Instruction List and Available Devices

(1) Dedicated instruction list

The following table lists the dedicated instructions that can be used with the A/D converter modules.

Instruction	Description	Reference section
G(P).OFFGAN	Switches to the offset/gain setting mode. Switches to the normal mode.	Appendix 2.1
G(P).OGLOAD	Reads the offset/gain values of the user range setting to the CPU.	Appendix 2.2
G(P).OGSTOR	Restores the offset/gain values of the user range setting stored in the CPU to the A/D converter module.	Appendix 2.3

POINT

When the module is mounted to a MELSECNET/H remote station, the dedicated instructions cannot be used.

(2) Available devices

The following devices are available for the dedicated instructions:

Internal devices		File register	Constant
Bit *1	Word		
X, Y, M, L, F, V, B	T, ST, C, D, W	R, ZR	-

*1: Word device bit designation can be used as bit data.
Word device bit designation is done by designating Word device . Bit No..
(Designation of bit numbers is done in hexadecimal.)
For example, bit 10 of D0 is designated as D0.A.
However, there can be no bit designation for timers (T), retentive timers (ST) and counters (C).

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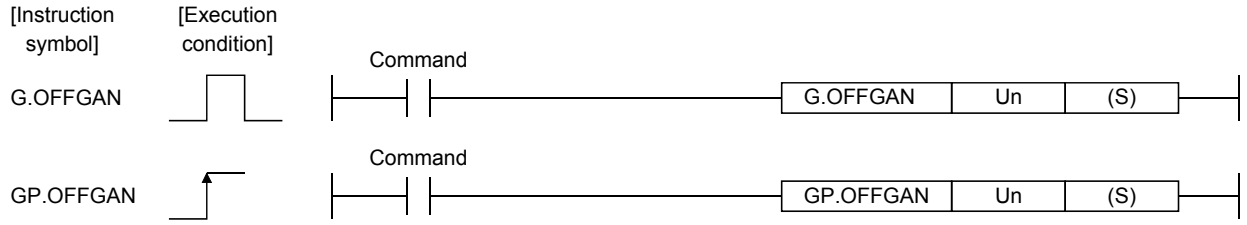
Appendix 2.1 G(P).OFFGAN

Switches the mode of the A/D converter module. (Normal mode to offset/gain setting mode, offset/gain setting mode to normal mode)

Setting data	Usable devices									
	Internal device (System, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Z□	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
(S)	—	○		—				—	—	—



Setting data

Setting data	Description	Setting range	Data type
Un	Start I/O number of the module	0 to FEH	Binary 16 bits
(S)	Mode switching 0: Switching to normal mode 1: Switching to offset/gain setting mode The setting of any other value results in "switching to offset/gain setting mode".	0 ,1	Binary 16 bits

(1) Function

Switches the mode of the A/D converter module.

- Normal mode to offset/gain setting mode (Offset/gain setting mode flag (XA) turns on.)
- Offset/gain setting mode to normal mode (Offset/gain setting mode flag (XA) turns off.)

POINT

(1) When the offset/gain setting mode is switched to the normal mode, Module READY (X0) turns from off to on.
Note that initial setting processing will be executed if there is a sequence program that makes initial setting when Module READY (X0) turns on.

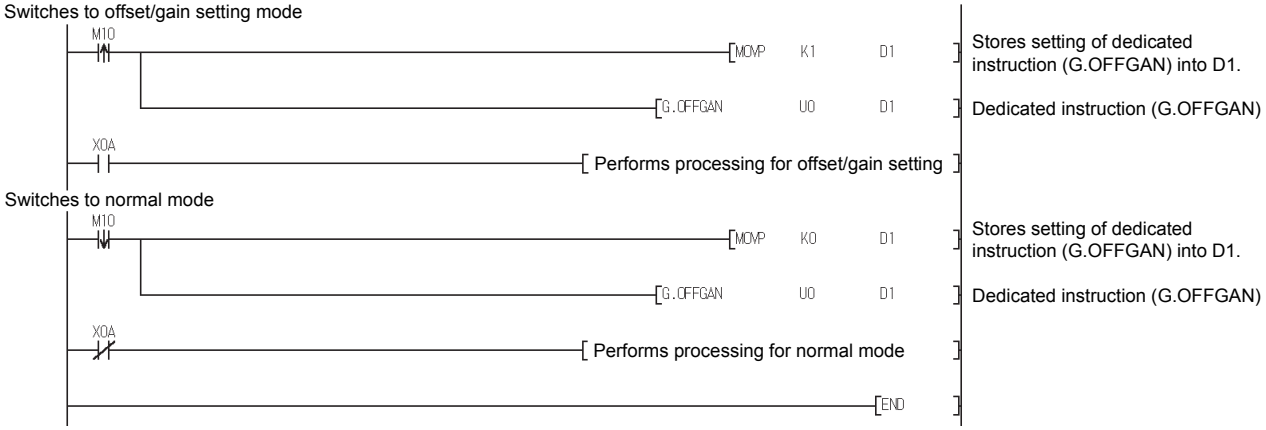
(2) When the offset/gain setting mode is switched to the normal mode, the A/D converter module holds the previous operation condition and resumes operation automatically under the previous operation condition.

(2) Operation error

No errors.

(3) Program example

The following program is designed to switch the A/D converter module mounted in the position of I/O number X/Y0 to X/YF to the offset/gain setting mode when M10 is turned on, and to return it to the normal mode when M10 is turned off.



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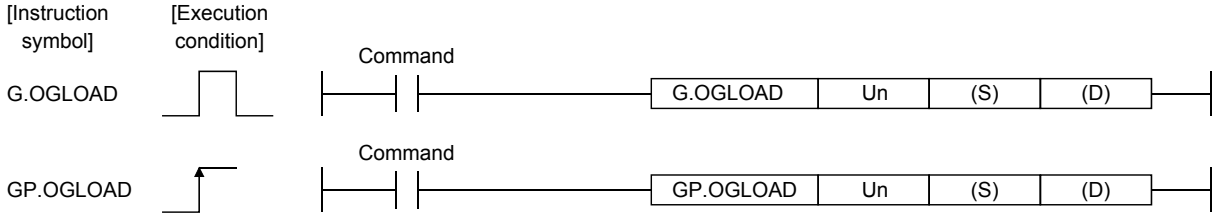
Appendix 2.2 G(P).OGLOAD

Reads the offset/gain values of the user range setting of the A/D converter module to the CPU.

Setting data	Usable devices									
	Internal device (System, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Z□	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
(S)	—	○		—				—	—	—
(D)	○			—				—	—	—



Setting data

Setting data	Description	Setting range	Data type
Un	Start I/O number of the module	0 to FEH	Binary 16 bits
(S)	Start number of the device in which control data is stored.	Within the range of the specified device	Device name
(D)	Device that is turned on 1 scan on completion of the dedicated instruction processing. (D) + 1 also turns on at an abnormal completion.	Within the range of the specified device	Bit

Control data *1 of the Q64AD (1/2)

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion	—	System
(S) + 2	Pass data classification setting	Specify the voltage/current of the offset/gain values to be read. 0: Voltage specified 1: Current specified b15 ~ b4 b3 b2 b1 b0 0 ~ 0 CH.4 CH.3 CH.2 CH.1	0000H to 000F H	User
(S) + 3	System area	—	—	—
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System

*1 Set only the pass data classification setting (S)+2. If data is written to the area set by the system, the offset/gain values will not be read properly.

Control data ＊1 of the Q64AD (2/2)

Device	Item	Setting data	Setting range	Set by
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH1 User range settings offset value	—	—	System
(S) + 13	CH1 User range settings gain value	—	—	System
(S) + 14	CH2 User range settings offset value	—	—	System
(S) + 15	CH2 User range settings gain value	—	—	System
(S) + 16	CH3 User range settings offset value	—	—	System
(S) + 17	CH3 User range settings gain value	—	—	System
(S) + 18	CH4 User range settings offset value	—	—	System
(S) + 19	CH4 User range settings gain value	—	—	System

＊1 Set only the pass data classification setting (S)+2. If data is written to the area set by the system, the offset/gain values will not be read properly.

Control data ＊2 of the Q68ADV (1/2)

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion	—	System
(S) + 2 (S) + 3	System area	—	—	—
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH5 Industrial shipment settings offset value	—	—	System
(S) + 13	CH5 Industrial shipment settings gain value	—	—	System
(S) + 14	CH6 Industrial shipment settings offset value	—	—	System
(S) + 15	CH6 Industrial shipment settings gain value	—	—	System
(S) + 16	CH7 Industrial shipment settings offset value	—	—	System
(S) + 17	CH7 Industrial shipment settings gain value	—	—	System
(S) + 18	CH8 Industrial shipment settings offset value	—	—	System
(S) + 19	CH8 Industrial shipment settings gain value	—	—	System
(S) + 20	CH1 User range settings offset value	—	—	System
(S) + 21	CH1 User range settings gain value	—	—	System
(S) + 22	CH2 User range settings offset value	—	—	System
(S) + 23	CH2 User range settings gain value	—	—	System
(S) + 24	CH3 User range settings offset value	—	—	System
(S) + 25	CH3 User range settings gain value	—	—	System
(S) + 26	CH4 User range settings offset value	—	—	System
(S) + 27	CH4 User range settings gain value	—	—	System
(S) + 28	CH5 User range settings offset value	—	—	System
(S) + 29	CH5 User range settings gain value	—	—	System

＊2 Setting is not necessary. If setting is made, the offset/gain values will not be read properly.

Control data *2 of the Q68ADV (2/2)

Device	Item	Setting data	Setting range	Set by
(S) + 30	CH6 User range settings offset value	—	—	System
(S) + 31	CH6 User range settings gain value	—	—	System
(S) + 32	CH7 User range settings offset value	—	—	System
(S) + 33	CH7 User range settings gain value	—	—	System
(S) + 34	CH8 User range settings offset value	—	—	System
(S) + 35	CH8 User range settings gain value	—	—	System

*2 Setting is not necessary. If setting is made, the offset/gain values will not be read properly.

Control data *3 of the Q68ADI

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion	—	System
(S) + 2	System area	—	—	—
(S) + 3				
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH5 Industrial shipment settings offset value	—	—	System
(S) + 13	CH5 Industrial shipment settings gain value	—	—	System
(S) + 14	CH6 Industrial shipment settings offset value	—	—	System
(S) + 15	CH6 Industrial shipment settings gain value	—	—	System
(S) + 16	CH7 Industrial shipment settings offset value	—	—	System
(S) + 17	CH7 Industrial shipment settings gain value	—	—	System
(S) + 18	CH8 Industrial shipment settings offset value	—	—	System
(S) + 19	CH8 Industrial shipment settings gain value	—	—	System
(S) + 20	CH1 User range settings offset value	—	—	System
(S) + 21	CH1 User range settings gain value	—	—	System
(S) + 22	CH2 User range settings offset value	—	—	System
(S) + 23	CH2 User range settings gain value	—	—	System
(S) + 24	CH3 User range settings offset value	—	—	System
(S) + 25	CH3 User range settings gain value	—	—	System
(S) + 26	CH4 User range settings offset value	—	—	System
(S) + 27	CH4 User range settings gain value	—	—	System
(S) + 28	CH5 User range settings offset value	—	—	System
(S) + 29	CH5 User range settings gain value	—	—	System
(S) + 30	CH6 User range settings offset value	—	—	System
(S) + 31	CH6 User range settings gain value	—	—	System
(S) + 32	CH7 User range settings offset value	—	—	System
(S) + 33	CH7 User range settings gain value	—	—	System
(S) + 34	CH8 User range settings offset value	—	—	System
(S) + 35	CH8 User range settings gain value	—	—	System

*3 Setting is not necessary. If setting is made, the offset/gain values will not be read properly.

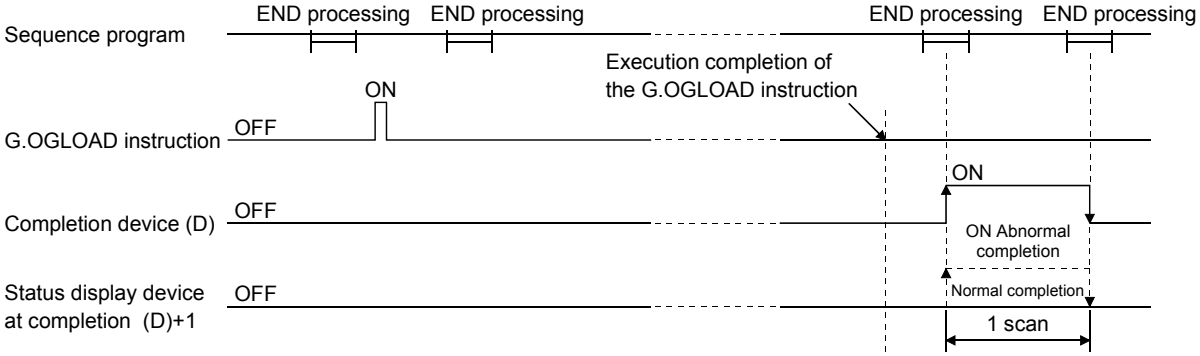
(1) Functions

(a) Reads the offset/gain values of the user range setting of the A/D converter module to the CPU.

(b) There are two types of interlock signals for the G(P).OGLOAD instruction: the completion device (D) and the status display device at completion (D) + 1.

1) Completion device
Turns on in the END processing of the scan where the G(P).OGLOAD instruction is completed, and turns off in the next END processing.

2) Status display device at completion
Turns on and off depending on the completion status of the G(P).OGLOAD instruction.
Normal completion : Stays off and does not change.
Abnormal completion: Turns on in the END processing of the scan where the G(P).OGLOAD instruction is completed, and turns off in the next END processing.

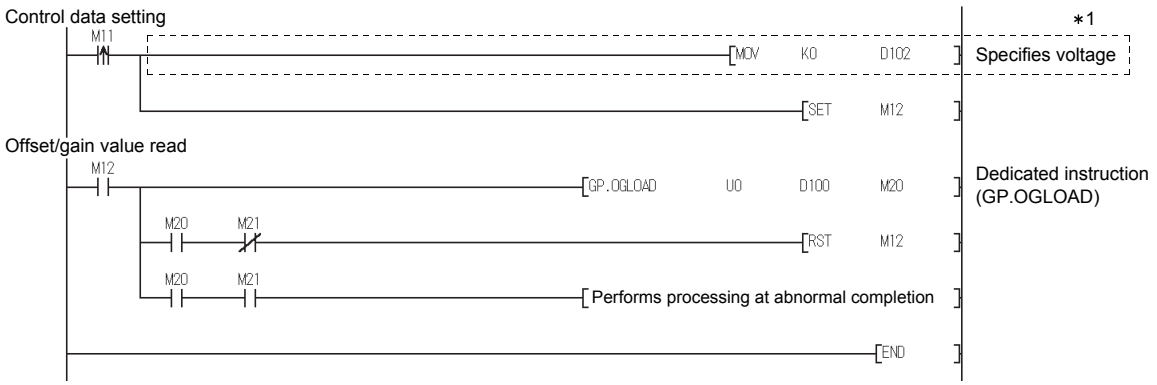


(2) Operation error

No errors.

(3) Program example

The following program is designed to read the offset/gain values of the A/D converter module mounted in the position of I/O number X/Y0 to X/YF when M11 is turned on.

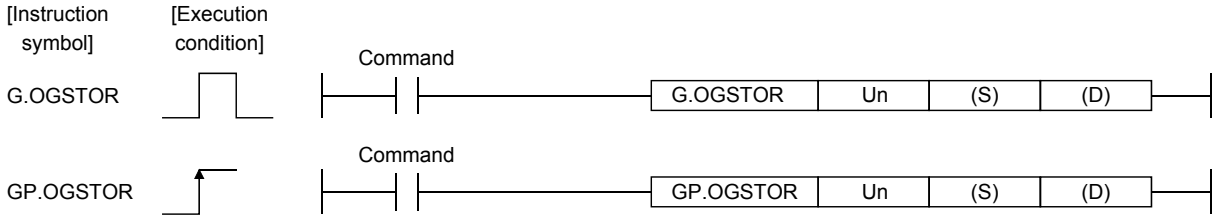


∗1: For the Q68ADV/Q68ADI, the program in the dotted area is not necessary.

Appendix 2.3 G(P).OGSTOR

Restores the offset/gain values of the user range setting stored in the CPU to the A/D converter module.

Setting data	Usable devices									
	Internal device (System, user)		File register	Link direct device J□\□		Intelligent function module device U□\G□	Index register Z□	Constant		Others
	Bit	Word		Bit	Word			K, H	$	
(S)	—	○		—				—	—	—
(D)		○		—				—	—	—



Setting data

Setting data	Description	Setting range	Data type
Un	Start I/O number of the module	0 to FEH	Binary 16 bits
(S) ＊1	Start number of the device in which control data is stored.	Within the range of the specified device	Device name
(D)	Device that is turned on 1 scan on completion of dedicated instruction processing. (D) + 1 also turns on at an abnormal completion.	Within the range of the specified device	Bit

＊1 When executing the G(P).OGLOAD instruction, specify the device designated in (S).
Do not change the data read with the G(P).OGLOAD instruction.
If it is changed, normal operation cannot be guaranteed.

Control data of the Q64AD (1/2)

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion (Error code)	—	System
(S) + 2	Pass data classification setting	The value set to Pass data classification setting (S)+2 using the G(P).OGLOAD instruction is stored. 0: Voltage specified 1: Current specified b15 ~ b4 b3 b2 b1 b0 0 ~ 0 CH.4 CH.3 CH.2 CH.1	0000H to 000F H	User
(S) + 3	System area	—	—	—
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System

Control data of the Q64AD (2/2)

Device	Item	Setting data	Setting range	Set by
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH1 User range settings offset value	—	—	System
(S) + 13	CH1 User range settings gain value	—	—	System
(S) + 14	CH2 User range settings offset value	—	—	System
(S) + 15	CH2 User range settings gain value	—	—	System
(S) + 16	CH3 User range settings offset value	—	—	System
(S) + 17	CH3 User range settings gain value	—	—	System
(S) + 18	CH4 User range settings offset value	—	—	System
(S) + 19	CH4 User range settings gain value	—	—	System

Control data of the Q68ADV (1/2)

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion	—	System
(S) + 2	System area	—	—	—
(S) + 3				
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH5 Industrial shipment settings offset value	—	—	System
(S) + 13	CH5 Industrial shipment settings gain value	—	—	System
(S) + 14	CH6 Industrial shipment settings offset value	—	—	System
(S) + 15	CH6 Industrial shipment settings gain value	—	—	System
(S) + 16	CH7 Industrial shipment settings offset value	—	—	System
(S) + 17	CH7 Industrial shipment settings gain value	—	—	System
(S) + 18	CH8 Industrial shipment settings offset value	—	—	System
(S) + 19	CH8 Industrial shipment settings gain value	—	—	System
(S) + 20	CH1 User range settings offset value	—	—	System
(S) + 21	CH1 User range settings gain value	—	—	System
(S) + 22	CH2 User range settings offset value	—	—	System
(S) + 23	CH2 User range settings gain value	—	—	System
(S) + 24	CH3 User range settings offset value	—	—	System
(S) + 25	CH3 User range settings gain value	—	—	System
(S) + 26	CH4 User range settings offset value	—	—	System
(S) + 27	CH4 User range settings gain value	—	—	System
(S) + 28	CH5 User range settings offset value	—	—	System
(S) + 29	CH5 User range settings gain value	—	—	System
(S) + 30	CH6 User range settings offset value	—	—	System
(S) + 31	CH6 User range settings gain value	—	—	System
(S) + 32	CH7 User range settings offset value	—	—	System
(S) + 33	CH7 User range settings gain value	—	—	System
(S) + 34	CH8 User range settings offset value	—	—	System

Control data of the Q68ADV (2/2)

Device	Item	Setting data	Setting range	Set by
(S) + 35	CH8 User range settings gain value	—	—	System

Control data of the Q68ADI

Device	Item	Setting data	Setting range	Set by
(S)	System area	—	—	—
(S) + 1	Completion status	Stores the status when the instruction is complete. 0 : Normal completion Other than 0: Abnormal completion	—	System
(S) + 2	System area	—	—	—
(S) + 3				
(S) + 4	CH1 Industrial shipment settings offset value	—	—	System
(S) + 5	CH1 Industrial shipment settings gain value	—	—	System
(S) + 6	CH2 Industrial shipment settings offset value	—	—	System
(S) + 7	CH2 Industrial shipment settings gain value	—	—	System
(S) + 8	CH3 Industrial shipment settings offset value	—	—	System
(S) + 9	CH3 Industrial shipment settings gain value	—	—	System
(S) + 10	CH4 Industrial shipment settings offset value	—	—	System
(S) + 11	CH4 Industrial shipment settings gain value	—	—	System
(S) + 12	CH5 Industrial shipment settings offset value	—	—	System
(S) + 13	CH5 Industrial shipment settings gain value	—	—	System
(S) + 14	CH6 Industrial shipment settings offset value	—	—	System
(S) + 15	CH6 Industrial shipment settings gain value	—	—	System
(S) + 16	CH7 Industrial shipment settings offset value	—	—	System
(S) + 17	CH7 Industrial shipment settings gain value	—	—	System
(S) + 18	CH8 Industrial shipment settings offset value	—	—	System
(S) + 19	CH8 Industrial shipment settings gain value	—	—	System
(S) + 20	CH1 User range settings offset value	—	—	System
(S) + 21	CH1 User range settings gain value	—	—	System
(S) + 22	CH2 User range settings offset value	—	—	System
(S) + 23	CH2 User range settings gain value	—	—	System
(S) + 24	CH3 User range settings offset value	—	—	System
(S) + 25	CH3 User range settings gain value	—	—	System
(S) + 26	CH4 User range settings offset value	—	—	System
(S) + 27	CH4 User range settings gain value	—	—	System
(S) + 28	CH5 User range settings offset value	—	—	System
(S) + 29	CH5 User range settings gain value	—	—	System
(S) + 30	CH6 User range settings offset value	—	—	System
(S) + 31	CH6 User range settings gain value	—	—	System
(S) + 32	CH7 User range settings offset value	—	—	System
(S) + 33	CH7 User range settings gain value	—	—	System
(S) + 34	CH8 User range settings offset value	—	—	System
(S) + 35	CH8 User range settings gain value	—	—	System

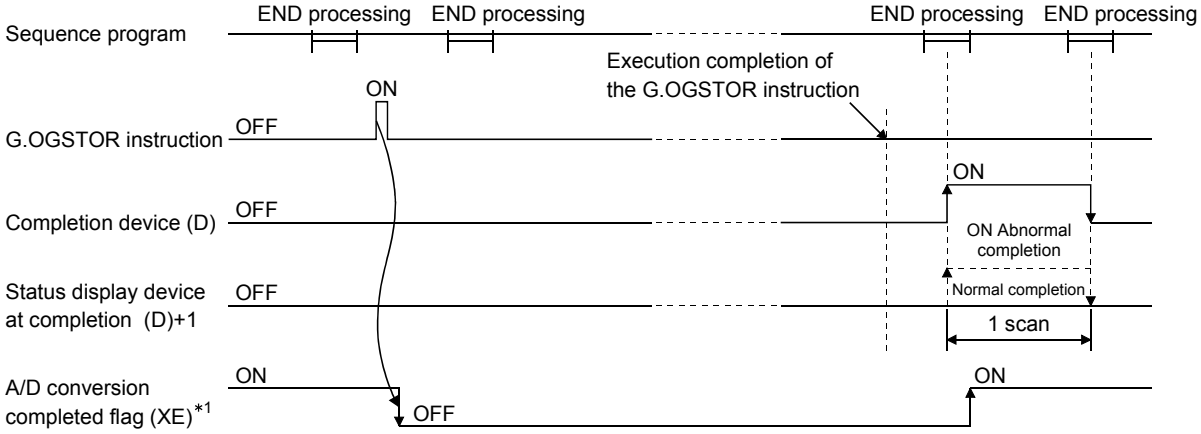
(1) Functions

(a) Restores the offset/gain values of the user range setting stored in the CPU to the A/D converter module.

(b) There are two types of interlock signals for the G(P).OGSTOR instruction: the completion device (D) and the status display device at completion (D) + 1.

1) Completion device
Turns on in the END processing of the scan where the G(P).OGSTOR instruction is completed, and turns off in the next END processing.

2) Status display device at completion
Turns on and off depending on the completion status of the G(P).OGSTOR instruction.
Normal completion : Stays off and does not change.
Abnormal completion: Turns on in the END processing of the scan where the G(P).OGSTOR instruction is completed, and turns off in the next END processing.



∗1 When the G(P).OGSTOR instruction is executed, A/D conversion is not performed. After the completion device (D) turns on, A/D conversion starts, the A/D conversion value is stored into the buffer memory, and A/D conversion completed flag (XE) then turns on.

(c) When the offset/gain values are restored, the reference accuracy falls to about less than three times of the accuracy before that.

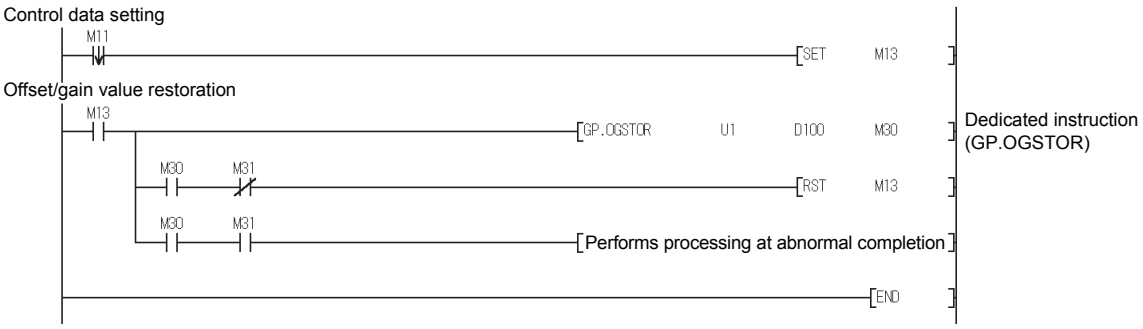
(2) Operation error

In any of the following cases, an error occurs and the corresponding error code is stored into the completion status area (S)+1.

Error code	Case resulting in operation error
161	The G(P).OGSTOR instruction was executed in the offset/gain setting mode.
162	The G(P).OGSTOR instruction was executed consecutively.
163	The G(P).OGSTOR instruction was executed for the model that differs from the model for which the G(P).OGLOAD instruction had been executed.

(3) Program example

The following program is designed to read the offset/gain values of the A/D converter module mounted in the position of I/O number X/Y0 to X/YF when M11 is turned on.



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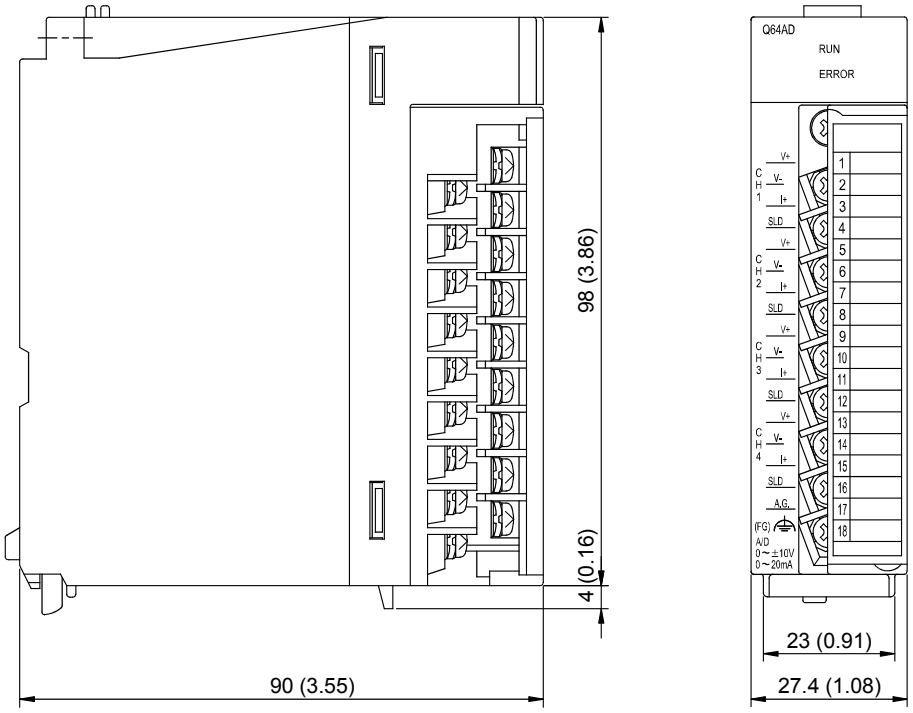
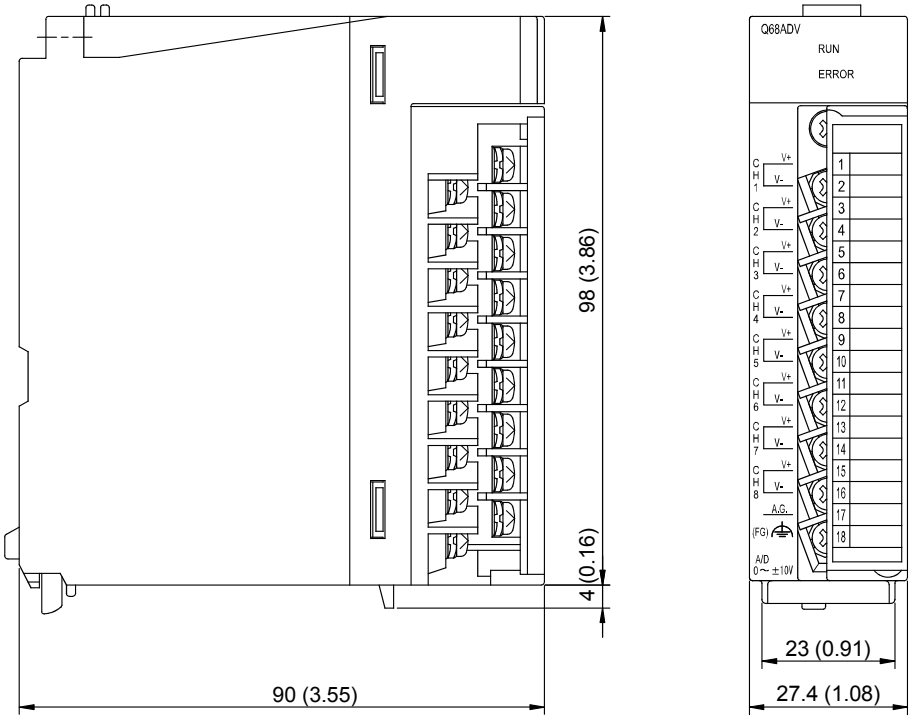
Appendix 3 External Dimension Diagram

(1) Q64AD



Unit: mm (inch)

(2) Q68ADV



Unit: mm (inch)

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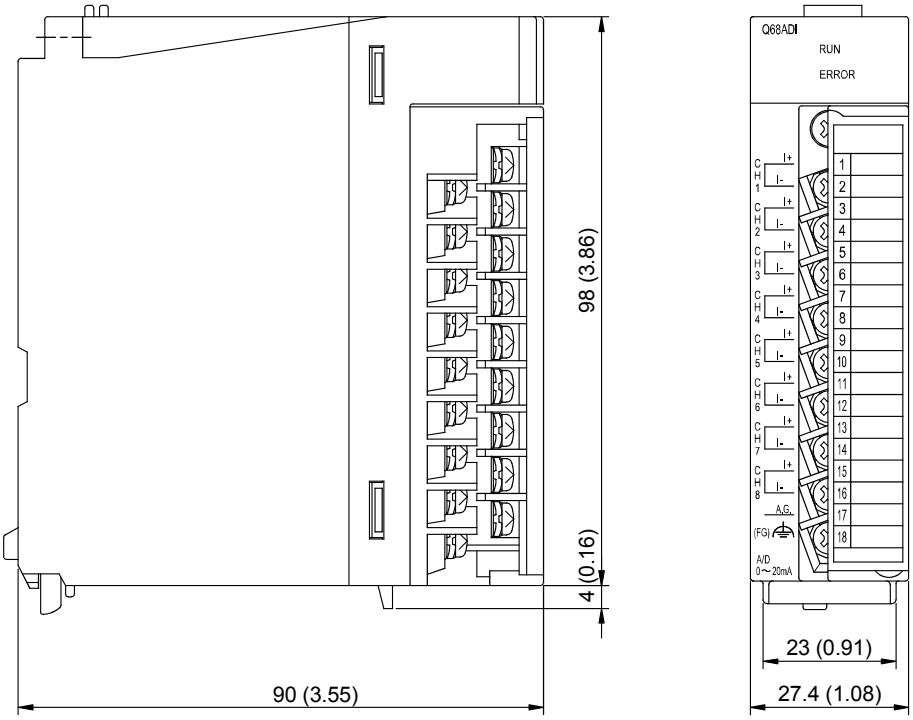
(3) Q68ADI



Unit: mm (inch)

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WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

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SH (NA)-080055-R

Analog-Digital Converter Module

User's Manual

MODEL	Q-A/D-U-S-E
MODEL CODE	13JR03
SH(NA)-080055-R(1212)MEE	

MITSUBISHI ELECTRIC CORPORATION

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